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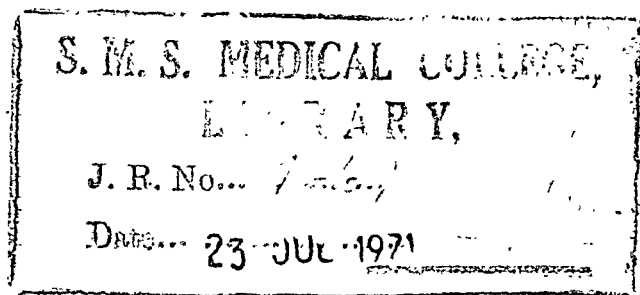
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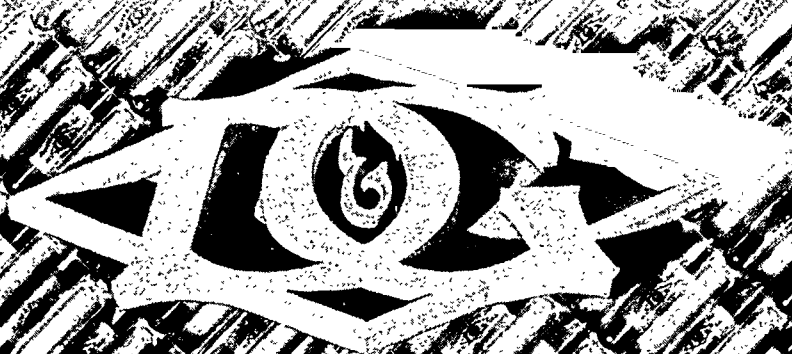
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# Mothers need help to end this daily struggle . . . . Why not suggest a diet-supplement?

**Lack of Vitamin B may be impairing the child's appetite**

• Investigators who have made a special study of the child who won't eat, report in a surprising number of cases, a physical basis for the trouble.

Children outwardly healthy and normal often prove a problem at the table because their diet fails to supply enough of the appetite-stimulating factor, Vitamin B! When the amount of this vitamin in everything the child usually eats has been taken account of, there is often less than necessary for good appetite.

This is undoubtedly the reason many children are difficult to feed. It is why the mother appeals to the physician for help.

What many physicians recommend, based on satisfactory results, is to give the child some rich source of Vitamin B daily.

They have found that a new food drink, Chocolate flavored Vitavose, provides the required abundance of this factor. It is made from nourishing wheat embryo, the valuable inner portion of the grain which



is provided by no other food drink and which contains Vitamin B.

Three heaping teaspoonfuls added to one glass of milk furnish the appetite-stimulating value of a *whole quart*.

Many mothers are already using a chocolate product to flavor milk. Recommend daily use of something that is more than a flavoring—this nourishing diet supplement, *Chocolate flavored Vitavose*.

*For infants*—Milk modifiers which provide Vitamin B. Squibb Vitavose for the older baby. Dextro-Vitavose for the newly born.

*Chocolate flavored Vitavose is a blend of sucrose, 30% Vitavose (malted wheat germ extract), cocoa, skim milk, lactose; flavored with vanilla.*



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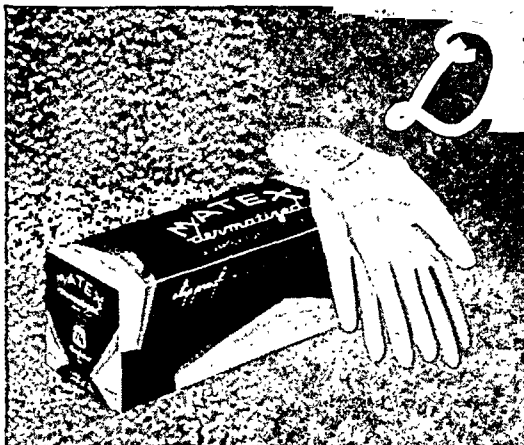
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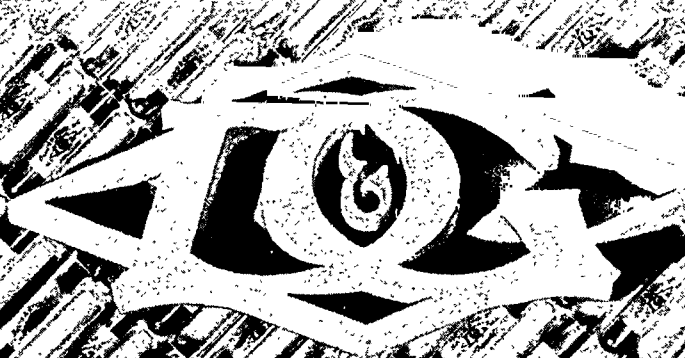
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# Mothers bribe, coax, and threaten in vain ... Why not help them check the cause?

## Poor appetite in children comes very often from lack of Vitamin B

"The modern complaint of lack of appetite in children, *particularly in those fed most carefully*, has been attributed largely... to a lack of Vitamin B," report Morgan and Barry. (Am. J. Dis. Child. 39:935-47, 1930.)

This has special significance for the physician whose practice is among children in average or better-than-average homes. It means that children may receive a plentiful and varied diet and still not get enough of the factor essential for appetite.

A way to restore appetite, many physicians find, is to add to the children's daily diet a supplement of this special factor. And now a delicious food drink supplies it—Squibb Chocolate flavored Vitavose.

Three heaping teaspoonfuls of Squibb Chocolate flavored Vitavose in a glass of milk make an appetizing drink, as rich



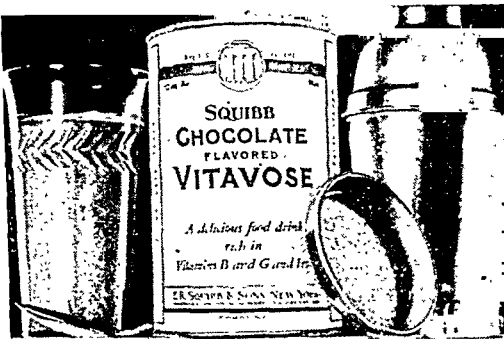
in Vitamin B as a whole quart of milk.

Given to children regularly every day, it helps restore a normal urge to eat.

Squibb Chocolate flavored Vitavose has other values, too, besides appetite-building. Made of malted wheat germ extract, a natural source of iron and other water-soluble minerals, it helps to furnish the important nutritive elements children need.

Tell mothers about Squibb Chocolate flavored Vitavose. Be sure to stress the advantages of serving it with meals or after school *regularly every day*. Now—for the child who won't eat—Squibb Chocolate flavored Vitavose!

*Vitavose for infants*—a milk modifier which supplies Vitamin B—Poor appetite often starts in infancy due to lack of Vitamin B in the baby's diet. This condition can be corrected by using as a milk modifier either of Squibb's two infants products—Vitavose for older babies, and Dextro-Vitavose for younger. (Vitavose is 100 times as rich as cow's milk in the appetite-stimulating factor, Vitamin B.)



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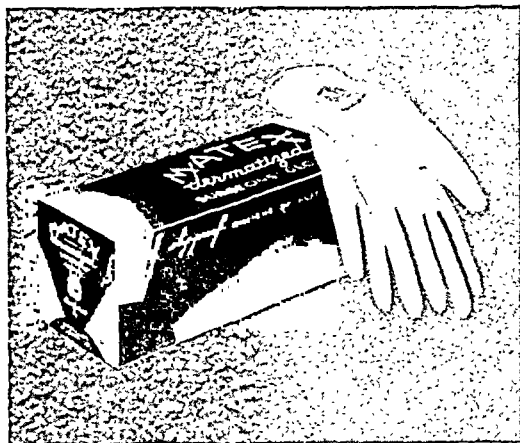
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# Spare mothers the ordeal of coaxing, threatening, scolding . . . .

**A delicious food drink, rich in Vitamin B, helps to stimulate appetite in the child who won't eat!**

When a mother complains about her child's poor appetite, have her make this test.

Suggest that she give a rich supplement of the factor known for its direct effect on appetite—*Vitamin B*.

This factor may not be supplied in sufficient quantity by the food the child eats. A varied diet of cereal, fruits, vegetables, eggs, and meat does not always provide enough. This undoubtedly helps account for the modern complaint of lack of appetite which prevails among children.

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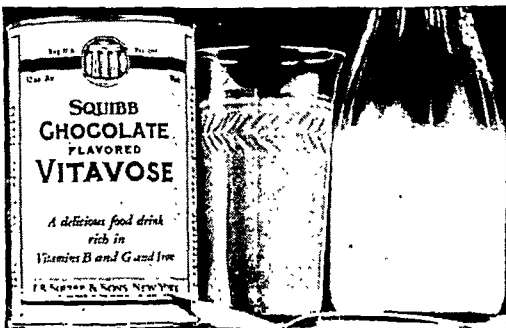
stimulating *Vitamin B*, Chocolate flavored Vitavose supplies children with an abundance of this essential factor. Three heaping teaspoonfuls added to one glass of milk provide as much *Vitamin B* as a whole quart of milk.

Chocolate flavored Vitavose also contains important minerals that children need. The wheat embryo from which it is extracted furnishes iron, calcium, copper and phosphorus.

Have mothers give it to children regularly every day. They like its flavor.

Daily, for the child who won't eat—Squibb Chocolate flavored Vitavose!

*A reminder!*—This appetite-stimulating product of Squibb is also available in a form suitable for the feeding of infants. Vitavose and Dextro-Vitavose are the two products which may be used to modify milk for the baby. Recommend them regularly.



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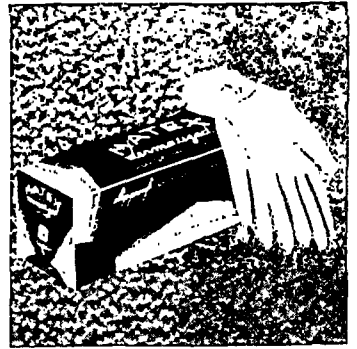


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# *Remote Complications* *in* **GONORRHEA**

**G**ONORRHEA in women is often attended with grave complications, not only in the genital organs but in remote organs, as well.

Recently a case of gonorrheal sepsis was reported with severe ulcerous endocarditis, swelling of the liver and spleen and acute diffuse glomerular nephritis. Cultures were demonstrable in the aortic valves. In another case, meningitis developed following a gonorrheal reinfection.

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## Anxious mothers often mistake the reason for the child's unwillingness to eat . . .

But investigators trace it frequently to an obscure source, originating with a deficiency of one factor in the child's diet—Vitamin B!



You've interrupted many scenes where the mother is urging milk and vegetables on the child, and the youngster is determined not to eat. The mother grows insistent, the child sullen.

Many physicians recall the experience of clinicians who report correcting lack of appetite in children by enriching their diet in *Vitamin B*.

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# *Specific* GONOCOCCAL INFECTION

IT is not generally recognized that the urethra, in female gonorrhea, is invaded by the gonococcus, often primarily, always secondarily; and the urethra may thus become a source of reinfection and chronicity unless the infection is controlled early. In the acute stage, therefore, the urethra should receive particularly careful attention.

A noted gynecologist recommends the following technique in acute gonorrhea:

1. After cleansing the vagina, swab the vagina, the cervix and the vulvar introitus with a 10 to 20 per cent solution of Argyrol.
2. Inject a 5 per cent solution of Argyrol into the urethra and bladder (a catheter should not be used).
3. Instil 20 to 30 minims of the same solution into the cervical os, and a few minims into the orifices of Bartholin's glands.
4. Insert a tampon soaked in 20 per cent Argyrol solution in the vagina and retain for four or five hours; apply a sanitary napkin to prevent leakage.

Under this therapy, the infection is generally fully controlled and extension to the deeper structures is prevented.

Argyrol medication is facilitated by the use of the new Argyrol tablets, which insure accuracy, genuineness, effectiveness and saving of time when a freshly made solution is desired in the office, at the bedside or in the operating room. Four tablets in one-half ounce of water make a 10 per cent solution in a few minutes; other strengths in proportion. To get specific results, be sure you have *genuine* Argyrol.

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## Warn mothers against forcing the child to eat . . . .

"TAKE ONE MORE BITE FOR MOTHER"



Loss of appetite, under-weight may often be overcome by giving children a daily addition of Vitamin B

**M**others are alarmed when the child stops eating and fails to gain weight. They may know it isn't wise to "baby" or scold. But they would rather risk spoiling the child than to endanger her health.

Often a word from the physician helps solve the problem. The physician may discover that the child's trying behavior has resulted directly from a period when her diet supplied very little of the factor essential for good appetite—*Vitamin B*.

All children need this factor. Their appetite is almost sure to be affected when they do not get enough. And the diet of many children consists largely of refined cereals, milk, and foods which are not especially rich in Vitamin B, but contains

few fresh fruits and vegetables which are good sources of the vitamin.

Many physicians recommend adding a special source of Vitamin B to the diet of children who fail to get enough—*Squibb's Chocolate flavored Vitavose!*

It increases by many times the Vitamin B value of milk. Three heaping teaspoonfuls added to a glass of milk raise the Vitamin B content to that of a whole quart.

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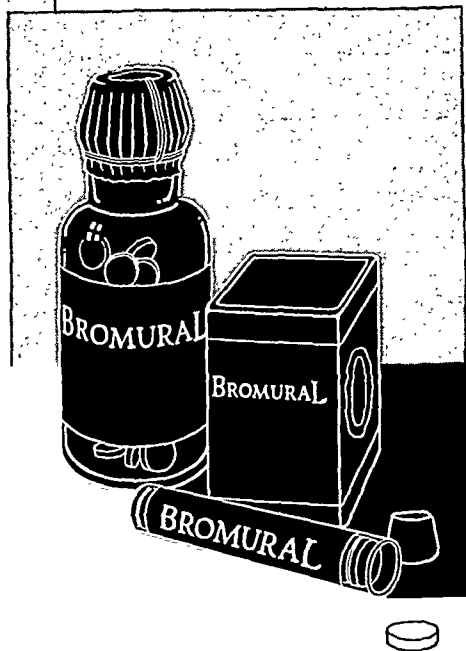


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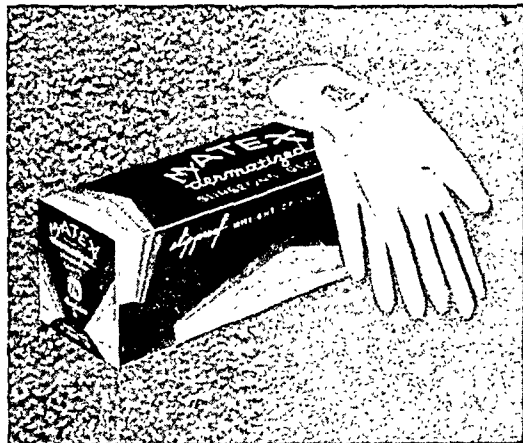
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# THE PUS TUBE

A FAMOUS gynecologist of a past generation declared that the best treatment for the gonococcal pus tube is to prevent the original infection from reaching the tube.

The progress of gynecology in the past two or three decades fully confirms the wisdom of this dictum. Greater attention to the acute gonorrheal infection will prevent its spread to the adnexa. Many gynecologists throughout the world place their reliance on Argyrol to localize the infection and prevent its extension to the uterus and tubes.

The technique usually employed is as follows:

1. An injection of a 5 to 10 per cent solution of Argyrol in the urethra and bladder.
2. An instillation of the same solution into the cervical os, permitting it to exude slowly into the vagina.
3. A vaginal tampon saturated with 20 per cent Argyrol solution retained several hours. Leakage is prevented by a sanitary napkin.

When the acute stage has subsided and a soothing, cleansing and healing agent is desired, a vaginal douche of 1-1000 Argyrol solution in hot water will be found most serviceable and grateful to the patient.

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# American Journal of Obstetrics and Gynecology

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VOL. XXVI

ST. LOUIS, JULY, 1933

No. 1

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## Original Communications

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### PREGNANCY AND LABOR COMPLICATED BY MYOMATOUS TUMORS OF THE UTERUS

RALPH E. CAMPBELL, M.D., F.A.C.S., MADISON, WIS.

(From the Department of Obstetrics, Johns Hopkins Hospital)

THE myoma in the pregnant woman has a far-reaching influence and may be an insuperable obstruction to labor. It has been pointed out that the fibroid tumor, embedded in the walls of the uterus, acts as a bar to conception; but, when pregnancy does occur, the results may be disastrous. The tumor interferes with the equable development of the uterus; and, therefore, frequently causes abnormal presentations, hemorrhage, immature births, infection, and high operative risk; any one of which may result in the loss of both mother and child.

Astonishing figures have been given showing the high operative incidence and the associated risk in this complication. Lafour<sup>1</sup> reported 300 cases complicating pregnancy, in which delivery occurred by the vaginal route and resulted in a maternal mortality of 40 per cent and a fetal mortality of 77 per cent. In 39 cases of forceps deliveries, Veit<sup>2</sup> reported a maternal mortality of 33 per cent with a similar figure for the children. Bland<sup>3</sup> had 87 versions which resulted in death for 64 per cent of the mothers and a fetal mortality of 83 per cent.

If the foregoing figures are to be accepted, we must agree with Barnes and Playfair<sup>4</sup> that the patient should be advised against incurring the risk of pregnancy; however, the picture is not so serious as these figures indicate.

Recent observers, such as Polak,<sup>5</sup> Pierson,<sup>6</sup> and others, have shown in their reports that we have benefited by correcting the sad experience of the early obstetricians who treated this complication with a high maternal and fetal mortality.

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NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

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In the series of 32,870 pregnant women covering a period of 32 years (1896-1928) admitted to the Woman's Clinic of the Johns Hopkins Hospital, I found 142 myomas recorded during pregnancy and labor, or an incidence of 0.43 per cent. Pierson<sup>6</sup> found 250 myomas in 30,836 pregnant women, or an incidence of 0.80 per cent, while Pinard<sup>12</sup> reported such a diagnosis in 84 of 13,915 cases, or a 0.60 per cent incidence.

Sixty of the 142 tumors in my series were so small as not to be considered of clinical importance, while in 82 cases the myomas gave rise to complications during pregnancy, labor, or the puerperium. Fifty-eight of these cases occurred in the colored race and 24 in the white; and 52 were primiparas and 30 multiparas. Table I shows the age incidence.

TABLE I

	PRIMIPARAS	MULTIPARAS
35 years or over	19	10
30-35 years	5	7
20-30 years	23	12
Under 20 years	5	1
	<u>52</u>	<u>30</u>

In 79 of the 82 cases, the records showed that 71 were married and 8 were single. Fifty-two of the 82, or 63 per cent, were pregnant for the first time; and only 18 women of the series had living children.

The above figures show that two-thirds of the tumors occurred in the colored race. There was a tendency for the tumor to be discovered at any time after twenty years of age; however, it may occur at an earlier age, as Gusserow<sup>7</sup> has reported cases in girls ten, fourteen, and sixteen years of age; while Anspach<sup>8</sup> found the tumor at birth. The foregoing statistics show the extreme age limits with a tendency for the fibroid to develop at a relatively advanced age both in primiparas and multiparas. Then, too, as the series shows, a woman between the ages of fifteen and twenty-five years is more apt to conceive than to develop fibroids; from twenty-five to thirty-five years of age the liability to both pregnancy and fibroids is greater; whereas between the ages of thirty-five and forty-five years, the liability to myoma is greatly increased and that to pregnancy decreased. One writer has pointed out that a barren uterus is more prone to the development of fibroids than one which has fulfilled its complete function by going through the hypertrophic and the involutionary changes of a gestation; the relative preponderance in the number of primiparas in this series would seem to justify such a statement.

All writers (Polak,<sup>5</sup> Lynch,<sup>9</sup> Pierson,<sup>6</sup> Lobenstine,<sup>10</sup> and others) agree that abnormal presentations, immature births (and in our series placenta

previa and premature separation may be added) are more common in pregnancy complicated by fibroid tumors. In our 82 cases normal cephalic presentations were present in only 62 per cent; face presentations were observed in two (2.4 per cent); and breech presentations in 10 cases (12.2 per cent); while transverse presentations occurred in 4 cases (4.8 per cent). Multiple pregnancy occurred twice (2.42 per cent); placenta previa three times as a complication (3.6 per cent); and premature separation of the placenta four times (5.1 per cent); while 12 abortions complete the series (14.7 per cent). Lafour<sup>1</sup> noted 49 per cent abnormal presentations in 100 pregnancies. Lynch<sup>9</sup> found 59 per cent cephalic presentations, 22 per cent breech, and 18 per cent transverse; and similar figures are reported by most investigators.

The three factors, sterility, immature birth, and premature labor, have been closely associated with fibroids, and the last two conditions contribute to the disastrous end-results when pregnancy occurs. As a working basis, we have considered the child as immature when it falls below 35 cm. in length and 1500 gm. in weight; as premature when these factors fall below 45 cm. and 2500 gm., and as mature when the latter figures are exceeded. In our entire series immaturity was observed twelve times; and prematurity nine times, four of the latter being stillborn; while mature stillbirths were noted in seven cases. Analysis of our figures shows that 32 of the 82 women, or 40 per cent, became pregnant for the first time only after a long period of sterility; and, as previously mentioned, only 18 women were mothers of living babies; 26 women, or 32 per cent, had histories of repeated immature births, and 11 of them had no living children. Investigation shows there is a relative degree of sterility as determined by the immature births and premature stillbirths. In other words, with only 18 mothers in possession of living babies as a result of these pregnancies, the relative sterility by immature births and the succumbing of the premature baby early in its existence, it would seem justifiable to regard the myoma as an important factor in sterility. In our series no definite percentage incidence can be accurately determined for sterility, as some of the women doubtless became pregnant later; but, in any event the report shows a rather high incidence of sterility. The probable causes of immature birth in pregnancy complicated by fibroids are: distortion of the uterine cavity; hyperirritability of the uterus; insecure embedding of the ovum, due either to an atrophic endometrium, or to edematous hemorrhagic changes occurring in an hypertrophied endometrium (see Figs. 1 and 2); and lastly, the degenerative changes frequently noted in the fetus itself. Pregnancy terminated by immature birth in a myomatous uterus has been observed by several investigators. Hofmeier<sup>11</sup> reported a 10 per cent incidence; Pierson,<sup>6</sup> 23 per cent; Pinard,<sup>12</sup> 15 per cent; and in our series, 14.7 per cent.

Several investigators have reported on sterility in myoma. Parvin<sup>13</sup> showed a general sterility in women of one to eight; and in fibroids, of one to three. Kelly and Cullen<sup>14</sup> reported 584 sterile women in 1149 fibroid cases, or 50 per cent incidence. These figures reflect the findings of most investigators. It is interesting to note that some observers state that sterile women tend to develop fibroids, which is apparently correct.

Other causative agents must not be overlooked in such a survey as this. Sampson<sup>15</sup> describes what he terms the "myomatous ovary" in as-



Fig. 1.—Cross section through a myomatous uterus in an acutely infected incomplete abortion. *a, b*, uterine cavity. *c*, Lining epithelium on opposite side of uterus to tumor. *c'*, Atrophic lining epithelium on the same side of uterus as tumor. *d*, Capsule of tumor. *e*, Normal myometrium. *f*, Myoma.

sociation with myoma uteri, and found that 17 of 150 cases of myoma uteri were associated with cystic ovaries; a condition mentioned also by other writers. Kelly and Cullen<sup>14</sup> recorded tuboovarian disease in 364 out of 934 myoma cases, and Young and Williams<sup>16</sup> in 35 out of 163 cases. Lastly, Tracy, quoted by Kelly and Cullen,<sup>14</sup> studied 3561 cases of myoma uteri and showed that the ovary was involved in 20 per cent. In the author's series the adnexal pathology was not reported sufficiently frequently to permit a definite conclusion. It must, however, be admitted

that adnexal disease associated with myoma uteri must have a direct bearing on sterility in certain instances. One investigator points out that the most important clinical fact relative to sterility is not that the uterus contains a fibroid, but depends upon its location and size. In the author's 29 cases which were studied grossly and microscopically, a single tumor was found eight times; a posterior wall tumor obstructing the pelvis and causing dystocia was noted in nine cases (see Fig. 3). My own observations show that the submucous tumor, the tumor distorting the uterine cavity, and the posterior wall tumor frequently terminate in immature birth. Histories of long-standing sterility prior to pregnancy were noted in many cases of submucous and posterior wall tumors. Schorler<sup>17</sup> found 16.6 per cent sterility in cervical fibroids; 24.17 per cent in interstitial growths; and 38.8 in submucous tumors. Young and

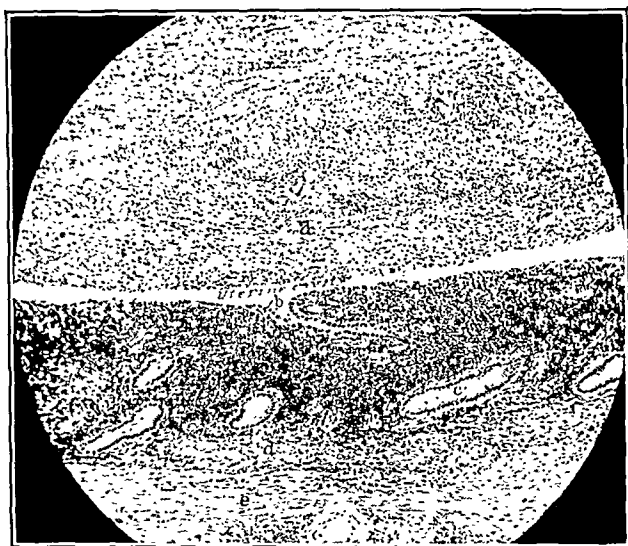


Fig. 2.—A higher magnification of Fig. 1. *a*, Myoma. *b*, Lining epithelium on opposite side of uterine cavity to tumor. *c*, A gland. *d*, Stroma with lymphogenous characteristics. *e*, Normal myometrium.

Williams<sup>16</sup> found 27 per cent sterility in the interstitial; 31 per cent in the submucous; and 42 per cent in the subserous varieties. The above figures, carefully analyzed, clarify and help to make certain what one would expect in sterility in regard to location of the tumor. Veit and Stoeckel<sup>30</sup> in their recent work have called attention to an interglandular dystrophy found frequently in conjunction with the fibroid uterus. Constitutional diseases are of prime importance in the causation of sterility, and malposition and developmental defects are of import. I wish to emphasize that only a few causes of sterility have been mentioned as occurring in association with fibroid tumors. While the fibroid tumor is of major importance in the diagnosis of sterility, it must not be overlooked that other conditions present may be the etiologic factors concerned.



It is not the aim of this report to go into the treatment of the fibroid uterus, but merely to mention the complications which occurred in our series. Mild degrees of discomfort were often experienced by the patient during gestation; pain was noted over the site of the tumor in 5 women; abdominal tenderness over sensitive tumors was observed in 4 cases. Gastric upsets manifested themselves in several instances, due, no doubt, to toxic absorption of the broken down tumor, or to pressure. Backache and pain radiating into the thighs were probably caused by pressure on the nerves. Varicosities of the lower extremities were observed in one case. A few patients complained of vague symptoms, such as weight and pressure in the pelvis. One patient suffered with pain over the bladder region, resulting from an anterior wall tumor; autopsy showed that the patient had a cystitis with urinary retention, a subsequent ureteral dilatation and pyelonephritis. Torsion of the uterus was observed twice and correctly diagnosticated once. Kelly and Cullen<sup>14</sup> and others have shown the seriousness of this complication for both mother and child, while Piquand and Lemeland<sup>18</sup> have shown by their operative experience the frequent fatal results of the complication. A rapidly growing tumor gave rise to respiratory and cardiac distress. Degenerative changes in the tumor signified themselves by pain, abdominal tenderness, a sensation of chills and malaise. Several operations were performed during pregnancy to relieve symptoms and conditions just mentioned, and will be discussed later under operative procedures.

Fibroids have a definite influence on the course of labor, which may be slow, tedious, and painful, and may result in abnormal presentations, early rupture of the membranes with subsequent ascending infection, uterine inertia, frequent operative risks, and death of both mother and child. Labor was closely observed in 61 cases. In 16, or 26 per cent, labor was prolonged; on the other hand, it was surprising to find that in 33, or 49 per cent, the duration of the labor was unusually short; while in 12, or 19 per cent, it was of normal duration. During labor, early rupture of the membranes took place in 23, or 37 per cent of the cases. It was of interest to note that in two cases pelvic tumors were pulled up out of the pelvis in the retraction of the lower uterine segment. Prolapse of the cord was experienced once. Adherent placenta was observed eight times and manual removal was necessary in each case. Postpartum hemorrhage occurred in 26, or 31.7 per cent of the series (hemorrhage was considered when the blood loss was over 600 c.c.). Four patients bled more than 1000 c.c. and the uterus was packed in each instance. Pierson<sup>6</sup> reported early rupture of the membranes in 44 per cent of his cases and Polak<sup>5</sup> cited a 45 to 60 per cent incidence, and also noted postpartum hemorrhage in 33 and 25 per cent of their cases respectively. Zangemeister<sup>19</sup> reported adherent placenta as a com-

plication and emphasized its relation to infection. Bland<sup>3</sup> reported 21 cases of adherent placenta; 13 of the patients died. Goodell<sup>29</sup> was one of the first to call attention to adherent placenta and the dangers of forcing the hand into a myomatous uterus, and thus opening up lymphatic channels to infection. I believe that adherent placenta is due to the absence of normal endometrium at the site of implantation of the ovum and to the consequent development of a defective decidua basalis. The term, adherent placenta, must not be confused with a retained placenta which has separated, but one which has failed to be expelled because of lack of expulsive power of the uterus, or may be impeded in its delivery by an obstruction in the uterine cavity. In my series, two patients had placentas which were separated but whose extrusion was obstructed by tumors projecting into the uterine cavity. Sampson,<sup>15</sup> Theilhaber,<sup>20</sup> Clark,<sup>21</sup> and others have pointed out the importance of the musculature of the uterus in regulating bleeding as well as aiding the uterine circulation; it is the muscular inefficiency in the fibroid uterus which seems to be of greatest importance in causing hemorrhage by preventing the control of the flow of the blood in the uterine plexus; the vessels denuded at the placental site are imperfectly constricted due to the aforesaid inefficiency. Defective development in the decidua basalis may be the contributing cause in the hemorrhage.

Ascent of the tumors heretofore mentioned was dependent upon the increase in size of the uterus, increase in the size of the tumor and the development of the lower uterine segment. Any pelvic tumor, as it increases in size and finds the pelvic cavity too cramped for its accommodation, tends to rise out of it. Furthermore, the increase in the size of the uterus with its corresponding elevation of the site of the attachment of the tumor, naturally tends to raise the tumor; and in labor with the development of the lower uterine segment, there is a tendency to remove from its obstructing position the very class of fibroids which is most likely to cause trouble.

In the puerperium, hemorrhage occurred twice, and submucous fibroids were diagnosed in each instance at curettage of the uterus. Twenty-six in 82 cases, 31.7 per cent, showed poor involution of the uterus. Puerperal infection was experienced in postabortal cases and also in a patient following term delivery. Necrosis of the myoma was observed in the puerperium in several instances and resulted in operative interference. It would seem that, with the retrograde changes taking place in the puerperium in conjunction with poor involution in a potentially infected field, a tumor lowered in vitality during pregnancy as a result of pressure, traumatized during labor, with its nutrition definitely affected in the puerperium when blood stasis and thrombosis are occurring, is very liable to necrosis and infection. The tumor of

low vitality readily becomes infected in case it is already the seat of early degenerative changes. Submucous fibroids are most apt to become infected after abortions or an infectious process in the puerperium; and the characteristic circulatory changes of involution tend to favor the progress of bacterial invasion. Infections are noted after curettage, intrauterine manipulation in which a portal of entry is afforded by

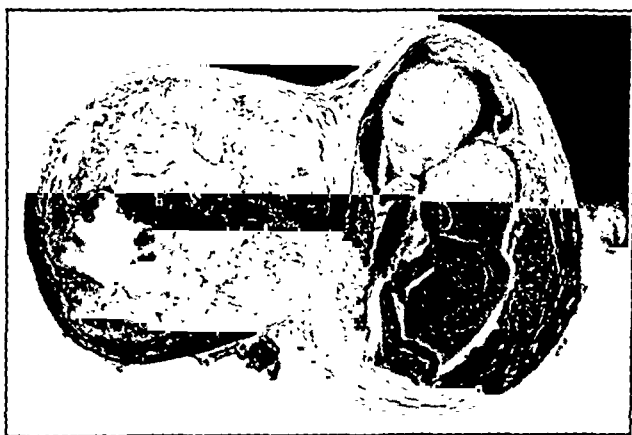


Fig. 3.—Posterior wall tumor obstructing pelvis. *a*, Fundus. *b*, Myoma. *c*, Extensive liquefaction necrosis of myoma with impending rupture of capsule.



Fig. 4.—Pelvic obstructing tumor of the cervix. *a*, *b*, Uterine cavity. *a*, Fundus. *c*, Fibroid tumor. *d*, Anterior lip of cervix.

injury to the endometrium or dislodgment of the tumor, adhesions to pus tubes and the intestines may be the portal of infection.

A high operative incidence was noted in the series, as will be shown by the subsequent data. Several observers have had the same experience. In our series, the operative cases were divided into two main groups: the surgical operative group and the obstetric operative group.

## SURGICAL OPERATIONS DURING PREGNANCY

In the surgical group, pelvic obstructing tumors determined operations in seven cases (see Figs. 3 and 4). In all of them no serious symptoms supervened during pregnancy, and operation was deferred until shortly before the onset of labor, at which time cesarean section and supravaginal hysterectomy were done in those cases in which myomectomy was inadvisable. Occasionally a pelvic tumor may rise out of the pelvis in the development of the lower uterine segment and the growth of the uterus. One patient, in whom a pelvic tumor the size of a fist was found in the upper part of the cervix, and which gave every promise of offering a serious obstacle to delivery, was examined at the end of pregnancy when a cesarean section was to be considered; but, surprisingly, the tumor was found to have risen out of the pelvis, and spontaneous delivery eventually occurred.

In 4 patients, myomectomies were performed during pregnancy. One patient, four months pregnant, and having a history of several miscarriages, complained of bearing-down and cramp-like pains. This patient was given bed-rest for a short interval and subsequently a myomectomy was performed as it was thought that an abortion was inevitable in view of the previous history; a few months later, a spontaneous delivery occurred. The remaining 3 myomectomies were performed because of symptoms resulting from necrotic changes in the tumors. Degenerative changes in the tumor signified themselves by pain and abdominal tenderness at the site of the tumor, a sensation of chill, malaise, an elevated temperature, and an increased leucocyte count.

In two patients at term, cesarean section with myomectomy was performed. Cesarean section and supravaginal hysterectomy was performed in two other patients who were at term; in these cases, every effort was made to save the uterus. Another patient was operated upon during pregnancy in whom a beginning peritonitis had been diagnosed; a torsion of the uterus was found at operation.

## SURGICAL OPERATIONS DURING LABOR

A single operation was performed during labor; this patient was a primipara having weak labor pains, with the cervix failing to dilate, and membranes intact. The uterus was studded with small fibroids; a cesarean section was decided upon. As it was the patient's desire to have another child, a conservative operation was done. She was again delivered at a later date of a second child, when cesarean section and supravaginal hysterectomy were done.

## SURGICAL OPERATIONS DURING THE PUERPERIUM

Five patients during the puerperium developed necrotic tumors in which myomectomy was performed. The occurrence of fever and ab-

dominal pain directed one's attention to the necrotic process. In 3 women with postabortal infection associated with necrotic tumors, it was necessary to remove the uterus as a life-saving measure. A supra-vaginal hysterectomy was necessary in a patient with puerperal sepsis following term delivery. The surgical operative cases during pregnancy, labor, and the puerperium numbered 26, or an incidence of 31.6 per cent.

#### OBSTETRIC OPERATIVE PROCEDURES

The following obstetric operative procedures were carried out: 2 low forceps operations; 4 breech extractions; 2 manual dilatations of the cervix with extractions; 3 versions, including a Braxton-Hicks; and one bag induction. Obstetric operations numbered 12 in all, an operative incidence of 14.6 per cent (12 in 82 cases). These obstetric operative procedures in conjunction with the surgical group gave a total operative incidence of 46.2 per cent (38 in 82 cases). Pierson<sup>6</sup> reported a total operative incidence of 46 per cent; Pinard,<sup>12</sup> 35 per cent; and Lockyer,<sup>22</sup> 82 per cent.

An attempt was made to study the maternal and fetal mortalities in the operative series. The fetal mortality in the obstetric operative cases showed 3 immature deaths, one premature death, and a term stillbirth. In the surgical group immature births accounted for 6 deaths and 2 cases were stillbirths, one of which was macerated. The operative fetal mortality gave a 33 per cent incidence; if immature deaths were deducted, the incidence would be 10 per cent. The gross fetal mortality of the series was 28 per cent. Pierson<sup>6</sup> reports a mortality of 35.6 per cent; and Pinard,<sup>12</sup> 32.6 per cent.

The maternal mortality was studied and showed a total of 3 deaths. One patient died of intestinal obstruction following myomectomy; the second patient was admitted to the clinic in extremis and died of a ruptured, gangrenous, and abscessed uterus; the third patient died of pyelonephritis following myomectomy. Three deaths in 82 cases gave an uncorrected incidence of 3.65 per cent. The third case mentioned gave the history of long-standing kidney disease, and it seems unfair to charge it against the mortality. Pierson<sup>6</sup> reports a mortality of 3.2 per cent; and Pinard,<sup>12</sup> 3.6 per cent. Troel<sup>23</sup> reported 157 myomectomies with 23.9 per cent fetal and 3.9 per cent maternal deaths. Kelly and Cullen<sup>14</sup> in 6 myomectomies noted 2 fetal and one maternal deaths. Berger<sup>9</sup> reported 22 gangrenous, abscessed uteri; 3 in 9 of patients operated upon lived, and 13 others died. Frys, quoted by Lynch<sup>9</sup> reported 3 cases of gangrenous, abscessed uteri, with one recovery.

Necrosis is one of the most interesting complications of the tumor during gestation and in the puerperium. I made a special study of the tumors removed at operation from both pregnant and nonpregnant women. Tumors removed at operation from 29 pregnant women were

examined, and showed a definite necrosis in 22, or 75.8 per cent; in 7 cases necrosis was absent. As a control I studied tumors removed at operation from 64 nonpregnant women; necrosis was found in only 5 of the tumors, or 7.8 per cent; whereas no degeneration was found in 59, or 92.18 per cent; so that upon comparative analysis of the two series, the relation of necrosis in myoma in pregnant and nonpregnant women is 75.8 per cent to 7.8 per cent, or as 9 to 1. Other observers report similar findings in tumors removed from the nonpregnant. Bland-Sutton<sup>24</sup> believes that necrosis may be found on examination in nearly all tumors during pregnancy. This statement would seem to corroborate my findings; and I am convinced that necrosis during pregnancy occurs much more frequently than is generally believed and may be found in the great majority of myomas.

A definite explanation as to the cause of necrosis is still problematical. A few anatomic facts may help toward a better understanding of the production of the necrosis. The tumor is enveloped in its capsule which contains parallel muscle bundles of looser structure than the tumor, with the laminae separated by lymph spaces, and a large number of vessels, the majority of which are veins and capillaries. The blood supply of the tumor often depends upon a single artery, usually not more than 3; the venous network overshadows the arterial tree. Vantrín, quoted by Lynch,<sup>9</sup> points out that a fibroid lies loosely in a bed, as described above, and due to the rotary movements of the tumor caused by uterine contractions, the tumor may be dislodged easily from its bed with an interruption of its blood supply, ultimately ending in necrosis. There is little doubt that the anatomic structure of the tumor, in conjunction with the mechanical factors, plays an important rôle in the production of necrosis. I make little distinction between necrosis in general and the red necrosis so often seen during pregnancy and the puerperium. Red degeneration is only a stage in the evolution of the necrotic process, perhaps a more acute, rapid, advancing necrosis with a hemorrhagic infiltration and the subsequent deposition of blood pigment. By way of illustration: the red degeneration, commonly seen in a torsioned pedicle, is a mechanical process incident to a sudden disruption of the blood supply attendant with acute symptoms; and similarly during pregnancy and the puerperium, the mechanical effects of the uterine contractions upon the tumor in its loose bed may traumatize or disrupt the blood supply and produce the same effect as in the torsioned pedicle. Several investigators have advanced their own ideas as to the cause of necrosis. Leith Murray<sup>25</sup> suggested a hemolytic process with the deposition of blood pigment; Fletcher Shaw<sup>26</sup> established thrombosis as an etiologic factor; while Taylor<sup>27</sup> denied that thrombosis occurred in the majority of his 30 cases. I observed thrombosis in 2 cases, one of which was frankly infected; the process has been likened to cerebral

softening in which there is a central terminal artery; others have pointed out an ischemia due to the strangulation by the edematous, thrombosed capsule of the tumor; a few have noted the frequency of necrosis in interstitial tumors and have attributed this to increased contractions

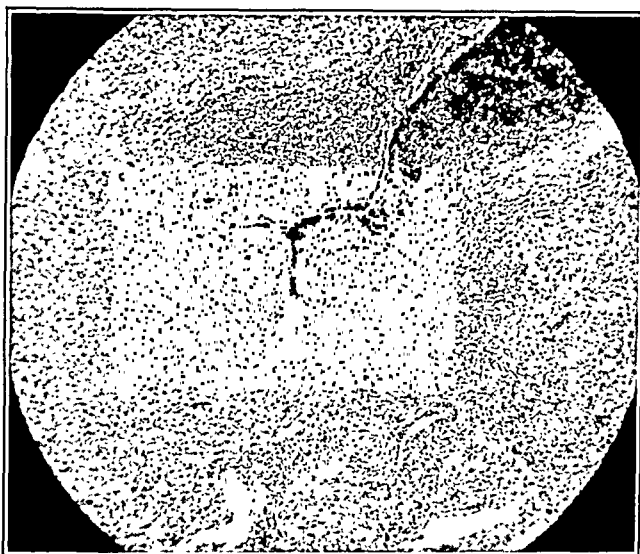


Fig. 5.—Cross section of cervix in ascending infection. *a*, Cervical cavity surrounded by cellular reaction.

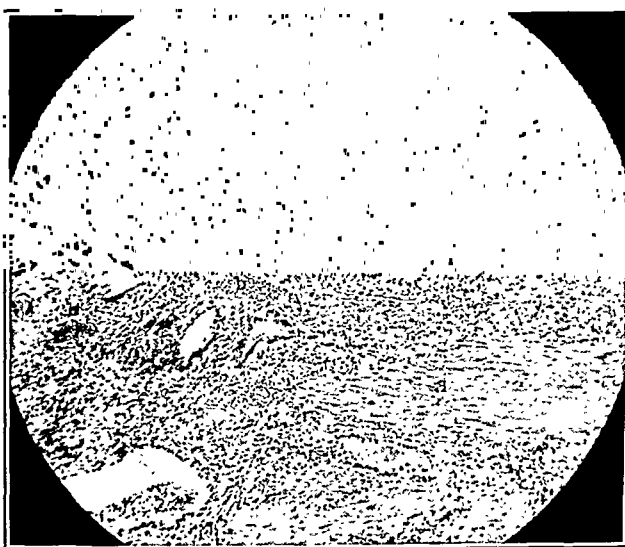


Fig. 6.—Same case as Fig. 5 with section taken higher up in uterus. *a*, Myomatous tissue. *b*, Focal areas of cellular infiltration. Note: Figs. 6 and 7 show the progress of ascending infection.

of the uterus; other workers believe there is a toxin of pregnancy; Leith Murray<sup>25</sup> stated that the lipoids in degenerating fibroids are antihemolytic and constitute an important factor in red degeneration; Shaw and Smith<sup>26</sup> sustain Murray; others, however, contradict them,

finding a lipoid increase in degenerating fibroids. In my own series I was impressed by certain tumors with round cell infiltration. The work of Von Franque<sup>28</sup> in recovering bacteria from myoma cases which were afebrile—and if I may also add the picture of lymphocytic infiltration occasionally seen—makes one believe that a low grade infection may lie dormant in these tumors awaiting a suitable change in environment to be lighted up. In addition, infection engrafted upon an early degenerative process may well result in frank necrosis. The relation of infection to necrosis was not lost sight of in this investigation; it is uncertain whether the necrosis in which infection occurs results directly from the infection or is incidental to it. Attention has been previously called to the frequent immature births associated with myoma uteri; in 3 cases of postabortal infection associated with necrotic tumors, it was

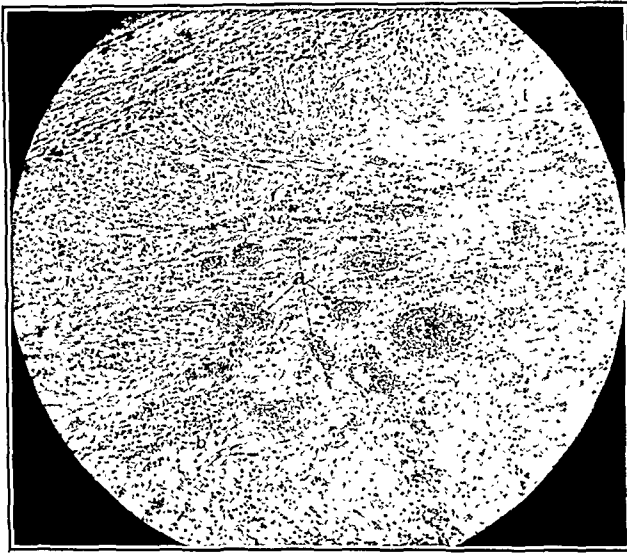


Fig. 7.—Myomatous uterus with phlebotic extension both into the uterine wall and myoma. *a*, Foci of phlebotic involvement.

necessary to remove the uterus as a means of saving the patient's life. Serial microscopic sections of the uterus in these postabortal infections showed that the infection could be traced from the cervix below to the fundus above, extending into the necrotic tumor by way of the lymphatics and blood; a marked thrombophlebotic process was observed in one uterus, and a definite lymphatic involvement was noted in another (see Figs. 5, 6, and 7—serial sections from a case of infected abortion). If infection is to play an important rôle in the myomatous uterus during pregnancy and a prominent part in its association with tumor necrosis, it must be remembered that the following predispose to infections: long labors, early rupture of the membranes, adherent placenta, subinvolution, and frequent obstetric manipulations. Any one of the foregoing conditions may lead to infection, with the subsequent loss of both mother and child.



The author is not alone in mentioning the serious import of infection aside from its relation to necrosis and feels that not enough emphasis has been placed on infection as an adjunct to myoma in complicating pregnancy. In this series, if radical cesarean section had not been

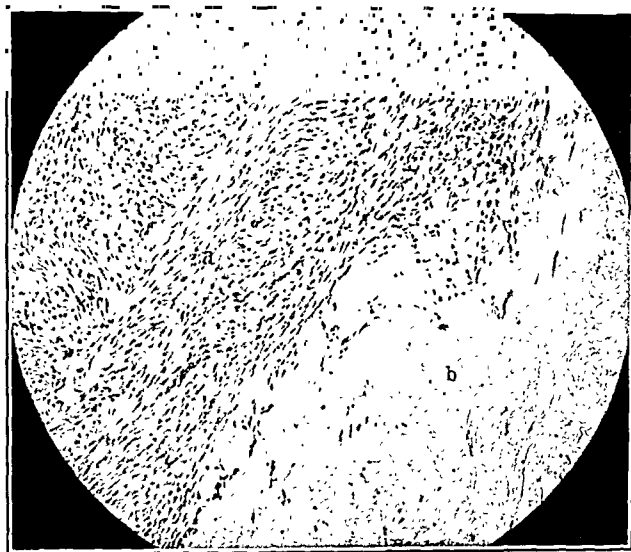


Fig. 8.—Section showing necrosis in a myoma. *a*, Typical myoma. *b*, Necrosis.

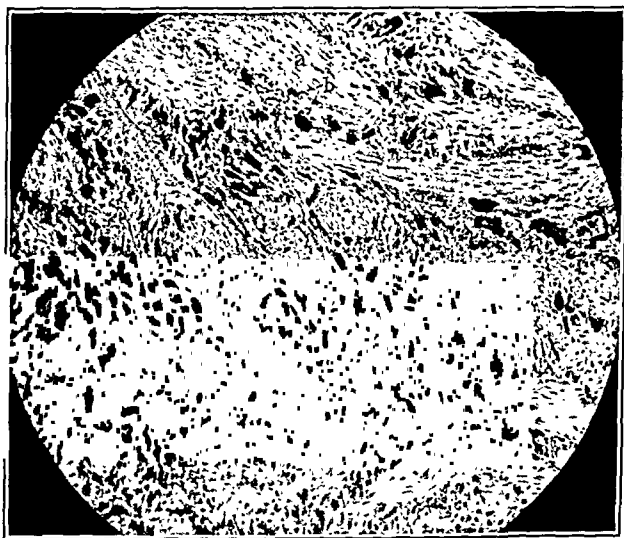


Fig. 9.—Fetal cell invasion of a myoma. *a*, Tumor cells. *b*, Fetal cells.

resorted to, a great many more patients would have died as the result of infection. The treatment of infection demands the greatest amount of perspicacity, and is, in short, a problem of “what not to do as well as what to do.”

In the detailed study of 29 tumors removed at operation during pregnancy, liquefaction necrosis or cystic degeneration and other types of degeneration were commonly seen (see Figs. 3 and 8); red degeneration was noted in both the puerperium and during pregnancy; calcification of the tumors was frequently observed; and adenocarcinoma was found engrafted upon one tumor; the decidua was carefully studied in these uteri removed at operation and showed in some a marked inflammatory reaction; unusual fetal cell invasion was noted in a few cases (see Fig. 9). Vascular obliteration was found in several tumors; thrombotic changes were noted twice; and one neoplasm showed fetal cell invasion of its vessel walls. Unusual fetal cell invasion of the tumor was noted seven times; it must be assumed in these tumors that there is a tendency for the ill-developed decidual barrier to offer a diminished resistance to the trophoblastic cell invasion.

#### SUMMARY AND CONCLUSIONS

1. The incidence of myoma in 32,870 pregnant women was 0.43 per cent, or 142 tumors were diagnosed. In 82 of the 142 fibroid cases, the patients had tumors of such importance as to complicate pregnancy, labor, or the puerperium.

2. The greater number of tumors were found in the colored race, and were observed more frequently in primiparas. The liability to fibroids was greatly increased between the ages of thirty-five and forty-five years.

3. Sterility, premature labor, and immature birth were closely associated with the fibroid complication. There is doubtless a relationship between the tumor and sterility. Immature birth and premature labor were observed in 25 per cent of the cases.

4. Mild degrees of discomfort were noted during pregnancy; severe and impelling indications frequently resulted in obstetric and surgical operative procedures.

5. Labor was often tedious, painful, and prolonged. Early rupture of the membranes took place in 37 per cent of the cases. Hemorrhage was a disturbing factor in 31 per cent. Adherent placenta was observed eight times. Twenty-six of the cases showed poor involution of the uterus. Infections were not uncommon.

6. Major surgical operative interference was necessary in 31.6 per cent of the cases. Obstetric operative procedures were performed in 14.6 per cent. The total operative incidence was 46.2 per cent.

7. Necrosis was found in 75.8 per cent of the tumors removed during pregnancy, compared to an incidence of 7.81 per cent from nonpregnant women, a ratio of 9:1.

8. Infection is not sufficiently emphasized in the literature as an important factor and an added danger in the fibroid complication; this series substantiates such a statement.

9. The gross fetal mortality for the series of 82 was 28 per cent. The gross operative fetal mortality was 33 per cent.

10. The gross maternal mortality was 3.65 per cent.

A better understanding of the obstetric principles involved in the fibroid complication with a replacement in certain patients of an attempt at delivery per vagina by the surgical operative route, notably cesarean section or cesarean section and hysterectomy, has led to an important evolution in the treatment of the complication. A clearer conception of the relative importance of necrosis and infection to the fibroid complication with an early recognition and proper treatment in both has saved a great many lives. The ability to evaluate and treat the less serious, though important, complications, such as early rupture of the membranes, inertia uteri, and subinvolution has added greatly to a favorable prognosis. The prevention of unnecessary obstetric manipulation has lessened a considerable risk. In the last analysis a complication of pregnancy has been reduced from an unfavorable prognosis for both mother and baby to one in which a more favorable outcome may be predicted.

#### REFERENCES

- (1) *Lafour*: Brit. M. J. 1: 331, 1888. (2) Quoted by Bland. (3) *Bland*: Gynecology, Medical, and Surgical, Philadelphia, 1926, F. A. Davis and Co., p. 948. (4) Quoted by Eden and Lockyer. (5) *Polak*: Surg. Gynec. Obst. 46: 21, 1928. (6) *Pierson*: Am. J. Obst. & Gynec. 14: 333, 1927. (7) *Gusserow*: Quoted by Lynch. (8) *Anspach*: Textbook of Gynecology, Philadelphia, 1927, J. B. Lippincott and Co. (9) *Lynch*: Am. J. Obst. 68: 427, 1913. *Lynch*: Pelvis Neoplasms, Gynec. & Obst. Monographs, New York, 1923, Appleton and Co. (10) *Lobenstine*: Trans. Am. Assn. Obst. & Gynec. 23: 371, 1910. (11) *Hofmeier*: Soc. Franconienne d'Obst. et de Gynec. 1907. (12) *Pinard*: Ann. d. Gynec. et Obst. 60: 165, 1901. (13) Quoted by Lynch. (14) *Kelly and Cullen*: Myoma of the Uterus, Philadelphia, 1909, W. B. Saunders and Co. (15) *Sampson*: Surg. Gynec. Obst. 16: 144, 1913. (16) *Young and Williams*: Boston M. & S. J. 165: 837, 1911. (17) *Schorler*: Ztschr. f. Geb. u. Gynäk. 2: 140, 1885. (18) *Piquand and Leme-laud*: l'Obstet. 14: 473, 1909. (19) *Zangemeister, Döderlein, Stoeckel, and others*: Schwangerschaft und Geburt bei Myom. des Uterus, Handbuch der Geburtshilfe, München, 1925, p. 65. (20) *Theilhaber*: Verhandl. d. Deutsche. Gesellsch. f. Gynäk. 10: p. 551. (21) *Clark*: Bull. Johns Hopkins Hosp. 10: 11, 1899. (22) *Lockyer*: Fibroids and Allied Tumors, London, 1918, McMillan and Co. (23) *Troel*: Zentralbl. f. Gynäk. 3: 110, 1910. (24) *Bland-Sutton*: Brit. M. J. 1: 1471, 1909. (25) *Murray*: J. Obst. & Gynec. Brit. Emp. 27: 534, 1910. (26) *Shaw*: J. Obst. & Gynec. Brit. Emp. 23: 1913. (27) *Taylor*: The Practitioner, June, 1906. (28) *Von Franque*: Zentralbl. f. Gynäk. 49: 1546, 1907. (29) *Goodell*: Am. J. Obst. 60: 921, 1909. (30) *Feit-Stoeckel*: Myom. und Endometrium, Handbuch der Gynäk. München, J. F. Bergmann, 6: 1928.

# THE EFFECT OF EXTRACTS OF THE URINE OF PREGNANT WOMEN ON THE HYPERPLASTIC ENDOMETRIUM

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RECENT reports on the efficacy of the so-called anterior pituitary luteinizing hormone in the treatment of functional uterine bleeding have been most encouraging. The hormone is obtained by extraction of the urine of pregnant women. It was first discovered by Zondek and Aschheim and due to the similarity of action between it and anterior lobe substance, it was called prolan. Reichert, Pencharz, Simpson, Meyer and Evans<sup>1</sup> have recently shown that the substance has no effect on the ovaries of the hypophysectomized animal. Hill and Parkes<sup>2</sup> were able to produce ovulation in the hypophysectomized animal with urine of pregnancy in only four instances out of nineteen. This work casts some doubt on the hypophyseal origin of the hormone and suggests that it is derived elsewhere and acts on the hypophysis, the excessive stimulation of the hypophysis in turn producing the changes in the ovary. Collip<sup>3</sup> has found a similar substance in the placenta. Burch and Cunningham<sup>4</sup> have been able to increase slightly the ovarian stimulating capacity of the hypophyses of spayed rats by the injection of placental extract. In a further series of experiments<sup>5</sup> from this laboratory, we have also been able to increase the ovarian stimulating capacity of the hypophyses of spayed rats by the use of an estrin-free placental extract.

While the hormone is generally regarded as being of hypophyseal origin, the evidence of a placental origin, however, must obviously be considered. In this connection it is interesting to note that Goldstine and Fogelson<sup>7</sup> obtained excellent results in the treatment of uterine hemorrhage by means of an alcoholic placental extract. Campbell and Collip also obtained excellent results with Collip's anterior pituitary-like fraction.<sup>8</sup> In the discussion of Novak and Hurd's paper<sup>9</sup> on the results obtained with the so-called anterior pituitary luteinizing hormone, Geist<sup>10</sup> reported a series of 22 women who were treated with this material preoperatively and whose ovaries showed no excessive luteinization. In closing the discussion, Novak<sup>11</sup> expressed the belief that the effect of bleeding is not due to the histologic effect but to an effect on some unknown bleeding factor.

Whether or not such a factor exists and if it does what its nature may be cannot be stated at present. Inasmuch as the endometrium is the actual point of the bleeding, it seemed advisable to study the endometrium at the various stages of the disordered cycle. It is of



Fig. 1.—Section of endometrium taken by cannula-aspiration method on February 10, after patient had been bleeding for two months.



Fig. 2.—Specimen of endometrium obtained on February 25, patient having received injections of the extract for the preceding three days.

course impossible to curette a patient as frequently as material is needed for a study of this kind. In order to overcome this difficulty we used a metal cannula which was easily inserted into the uterus. When the cannula came to rest against the uterine wall, strong suction was made with an attached syringe. Sufficient tissue was always

obtained for study. By this method we were able to secure ample material and at the same time not to remove so much material that we would have to consider the factor of regeneration between biopsies. This method has been reported elsewhere.<sup>1</sup>



Fig. 3.—Biopsy of endometrium obtained on March 27, sixteen days following cessation of bleeding and five days preceding onset of bleeding.



Fig. 4.—Endometrium taken on April 21, seven days following cessation of bleeding.

The following case report illustrates the effect of the extract in a case of endometrial hyperplasia.

#### CASE REPORT

Mrs. O. G. is a white, thirty-eight-year-old married nullipara, admitted to the Vanderbilt University Hospital Feb. 2, 1932, with chief complaint of flooding.

Present History: Periods irregular for the past four years. During the past year she had had only four periods. Seven weeks before admission she began

menstruating. At first the flow was scanty; but later it became very profuse. There had been mild pain in the left lower quadrant. She had had no dysmenorrhea and no leucorrhea. The sella turcica appeared normal in the roentgenogram. Basal metabolic rate was minus 3 per cent. On February 10, a section of the endometrium taken by biopsy showed relatively dense stroma and numerous glands with widely varying lumina. The glandular epithelium showed marked pseudostratification and the diagnosis of cystic glandular hyperplasia was made (Fig. 1).

On February 22 the patient was still bleeding. Twelve units of the extract (Antuitrin S.) were given intramuscularly. Thirty-seven units of the extract were given on February 23 and again on February 24. On February 25 patient was bleeding slightly. Twenty-five units of the extract were given. A section taken by biopsy at this time showed considerable proliferation of the glandular epithelium. There was a moderately dense stroma. There was clearly no evidence of progestational proliferation of the endometrium. The epithelium was of the interval type and was similar to that seen following the injection of estrin in castrated animals (Fig. 2).

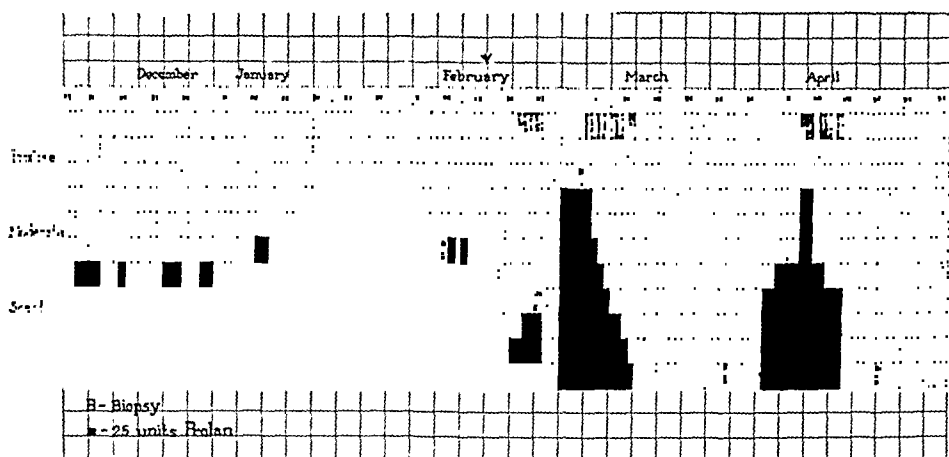


Fig. 5.—Graphic record of bleeding in relation to treatment and biopsies. Black blocks represent bleeding.

On March 3 the patient was bleeding profusely. A section of the endometrium taken by biopsy showed glands of irregular size. The epithelium was markedly pseudostratified and mitoses were present. Underneath the surface epithelium an occasional polymorphonuclear leucocyte was seen. On March 4 the patient was bleeding moderately. One hundred units of the extract were given. On March 5 patient was bleeding moderately. One hundred units of the extract were given. On March 6 patient was bleeding moderately and a hundred units of the extract were given. On March 7 patient was bleeding slightly. One hundred units of prolan were given. On March 9 there was practically no bleeding. One hundred units of the extract were given. On March 11 there was only slight spotting. Fifty units of the extract were given at this time.

On March 27 there was no bleeding. A section of the endometrium taken by biopsy showed the typical Swiss-cheese pattern with marked pseudostratification of the epithelium. There was dense stroma and the glands were dilated (Fig. 3).

On April 2 bleeding started again but patient did not return to clinic.

On April 8 the patient returned to the clinic and received treatment, with immediate diminution of flow. Bleeding ceased on April 14.

On April 21 she returned to clinic and another endometrial biopsy was obtained which showed no marked histologic changes (Fig. 4).

Fig. 5 graphically illustrates the effect of the extract and gives the relationship of treatment to biopsies.

#### SUMMARY

This case clearly illustrates the beneficial effects of the extract of urine of pregnant women in a case of endometrial hyperplasia. It also illustrates the fact that the extract may exercise its immediate effect without producing progestational proliferation. However, it is entirely possible that progestational proliferation may occur at some future time in this case.

We are indebted to Parke, Davis & Company for a liberal supply of Antuitrin S.

#### REFERENCES

- (1) Reichert, F. L., Pencharz, R. I., Simpson, M. E., Meyer, Karl, and Evans, H. M.: *Am. J. Physiol.* 100: 157, 1932. (2) Hill, M., and Parkes, A. S.: *J. Physiol.* 71: 40, 1931. (3) Collip, J. B.: *Canad. M. A. J.* 22: 761, 1930. (4) Burch, John C., and Cunningham, R. S.: *Proc. Soc. Exper. Biol. & Med.* 27: 331, 1930. (5) Klingler, Harold, Burch, John C., and Cunningham, R. S.: *Surg. Gynec. & Obst.* 56: 137, 1933. (6) Zondek, B., and Aschheim, S.: *Arch. f. Gynäk.* 130: 1, 1927. (7) Goldstine, M. T., and Fogelsen, S. J.: *AM. J. OBST. & GYNEC.* 21: 464, 1931. (8) Campbell, A. D., and Collip, J. B.: *Canad. M. A. J.* 22: 219, 1930. (9) Novak, E., and Hurd, G. B.: *AM. J. OBST. & GYNEC.* 22: 501, 1931. (10) Geist, Samuel H.: *AM. J. OBST. & GYNEC.* 22: 935, 1931. (11) Novak, Emil: *AM. J. OBST. & GYNEC.* 22: 937, 1931. (12) Burch, John C., and Klingler, Harold H.: *J. Tenn. State M. A.* 25: 142, 1932.

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Irving, F. C.: *Treatment of Eclampsia by Plasmapheresis*, New England J. M. 203: 1070, 1930.

The writer reports results with the treatment of eclampsia by means of plasma removal or plasmapheresis, as first performed in experiments by Abel, Rowntree and Turner. The procedure is as follows: A liter of blood from the vein at the elbow is drawn under sterile precautions into a sodium citrate solution. It is centrifugalized for twenty minutes. After removal of the supernatant plasma, normal saline is added to the remaining corpuscles. After another centrifugalization the corpuscles are finally mixed with enough fresh salt solution to make one liter which is reinfused into the patient.

The withdrawal of 1000 c.c. of blood is almost always followed by a rapid and marked fall of blood pressure. If convulsions cease nothing further is done. Convulsions, twitching or a marked rise in blood pressure are indications for repetition of the plasmapheresis. Of the 17 eclamptic patients treated, 12 required this procedure but once, in 4 a second and in one a third plasma removal became necessary. Only one patient died, as a matter of fact, of pneumonia and empyema on the sixteenth day. Of the 17 babies 8 died, 6 of them before labor was ended.

EHRENFEST.



# A CLINICAL STUDY OF 403 CASES OF ADENOCARCINOMA OF THE OVARY: PAPILLARY CYSTADENOMA, CARCINOMATOUS CYSTADENOMA, AND SOLID ADENOCARCINOMA OF THE OVARY

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THE major group of the malignant neoplasms of the ovary consists of adenocarcinoma. Sarcomas and teratomas occur with such infrequency that when found they often elicit a report of the individual case. Adenocarcinomas, however, representing the general group of malignancy of the ovary, are significant because of their common occurrence, and the statistical opportunity they afford to study certain features of the group as a whole. Such a study is presented here, and an attempt has been made to compare the clinical symptoms and final results with surgical and pathologic data. The study included all cases of clinically malignant adenomas of the ovary considered operable and in which operation was performed at The Mayo Clinic in the period of eleven years between January, 1917 and December, 1927, inclusive. Extensive recurring carcinoma, and abdominal carcinomatosis considered inoperable, in cases in which exploration only was undertaken, were excluded as unsuitable for the study.

With the purpose of bringing out any inherent differences in malignant potentialities, the following morphologic types of adenocarcinoma of the ovary were recognized: papillary cystadenoma, carcinomatous cystadenoma, and solid adenocarcinoma. The group consisted of 403 cases, the growths in 254 of which were papillary cystadenomas: in 72, carcinomatous cystadenomas, and in 77, solid adenocarcinoma.

## INCIDENCE BY AGE, AND PAST HISTORY

The different neoplasms affected patients of the following average ages: papillary cystadenoma, forty-six and nine-tenths years; carcinomatous cystadenoma, forty-six and seven-tenths years; solid adenocarcinoma, forty-eight and thirteen-hundredths years. Of those who had the different neoplasms, the ages of the oldest patients were as follows: papillary cystadenoma, seventy-three years; carcinomatous cystadenoma, sixty-four years; and solid adenocarcinoma, sixty-nine years, while the youngest patients in the three groups were sixteen years, one and seven-tenths years, and nineteen years, respectively. It was noted that these types of malignancy occurred most frequently in the fifth and sixth decades of life. The drop in the seventh and eighth decades may

be attributed to decrease in the number of persons who, under any conditions, would be alive at those ages, rather than to lowered susceptibility to the disease in later years of life. There was no outstanding difference in the incidence by age in the three groups.

The three types of neoplasms were distributed among married and single women as follows: papillary cystadenoma, 29 single and 225 married women; carcinomatous cystadenoma, 14 single and 58 married women; solid adenocarcinoma, 18 single and 59 married women. Of the 225 married women who had papillary cystadenoma, 152 had had children; the same was true of 47 of the 58 married women who had carcinomatous cystadenoma and of 41 of the 59 married women who had solid adenocarcinoma. A family history of carcinoma was noted in 83 of the 403 cases, or 20.6 per cent. Except in cases in which the disease was extensive there was little unfavorable effect on the general health. Previous operations on the ovary were recorded to designate the possibility of etiologic factors; there were 19 such operations. The small number of operations on the breast, there were 8, did not suggest any association between the lesions of the ovary and those of the breast.

#### SYMPTOMS

The histories of menstrual and pelvic difficulty were analyzed for abnormalities which might be of diagnostic value. Interference with normal ovarian function was indicated by change in periodicity of menstrual bleeding and by abnormal loss of blood in menstruation. There were no consistent changes that could be considered characteristic of the disease except as general indications of interference with ovarian function. Amenorrhea of the menopause was present in 192 of the 403 cases (47.64 per cent). Metrorrhagia or a bloody vaginal discharge was a significant symptom when found, but was not a consistent symptom. It occurred in 32 (12.59 per cent) of the 254 cases of papillary cystadenoma; in 22 (30.55 per cent) of the 72 cases of carcinomatous cystadenoma, and in 25 (32.46 per cent) of the 77 cases of solid adenocarcinoma. The high incidence of pain among the 403 cases (52.6 per cent) is of interest in view of the prevailing impression that carcinoma is in general painless. Intraabdominal tumor, however, may produce pain from general intraabdominal pressure, peritoneal irritation, interference with blood supply, or pressure on other organs and the sequellae of this. That the pain in the disease is variable in degree and character is indicated by the diversity of terms used in describing it, such as "drawing," "throbbing," "dragging," "distressing but not severe," "dull ache," "bearing down," "burning," "darting," "sharp," "tearing," "colicky," "soreness," "twinges of pain," and "intermittent intense pain." Backache was not an outstanding feature; it was mentioned by only 33 (8.18 per cent) of the entire group of patients.

## MORTALITY AND LENGTH OF LIFE

Of the 403 patients, 388 have been traced, and of these, 232 (59.79 per cent) were living at the time the study was made, three years or more after operation, and 156 (40.20 per cent) were dead. The proportion of deaths was much lower among the patients who had papillary cystadenoma than among those who had carcinomatous cystadenoma or solid adenocarcinoma. Sixty-three or 27.27 per cent of the 231 traced patients with papillary cystadenomas, 40 or 55.55 per cent of the 72 traced patients with carcinomatous cystadenoma, and 53 or 62.35 per cent of 85 traced patients with solid adenocarcinoma were dead.

The duration of life since operation, of those whom follow-up investigations had revealed to be living at the time the data were assembled, was as follows: 168 of those who had papillary cystadenoma were living, of whom 6 (3.57 per cent) had lived three years; 97 (57.73 per cent), five years, and 65 (38.68 per cent), ten years. Thirty-two of those with carcinomatous cystadenoma were living, of whom four (12.5 per cent), had lived three years; 9 (28.12 per cent), five years, and 19 (59.37 per cent), ten years. Also 32 of those with solid adenocarcinoma were living, of whom 2 (6.25 per cent) had lived three years; 6 (18.75 per cent), five years, and 24 (75 per cent), ten years.

Twenty-seven of the 156 patients (17.30 per cent) died later than three years after operation; 8, later than seven years after operation, and one in the fifteenth year after operation. All the patients died of abdominal recurrence or of distant metastasis. The 14 patients who died within thirty days have not been considered further in the analysis of end-results.

## MORTALITY AND LENGTH OF LIFE IN RELATION TO UNILATERALITY AND BILATERALITY OF INVOLVEMENT

It is well known that carcinomatous involvement may occur in both ovaries, as primary lesions in both, or one as a metastatic lesion from the other. It was of interest, therefore, to determine the incidence of bilaterality and to compare the mortality and length of life of those patients who had unilateral with those who had bilateral malignant growths. In the cases considered for analysis, there was not any evidence of metastasis. There were remaining 274 cases: 206 cases of unilateral, and 68 cases of bilateral tumor. Of the 206 patients with unilateral tumor, 37 (17.96 per cent) had died when this study was made, whereas of the 68 with bilateral tumors, 30 (44.11 per cent) had died.

Therefore, in the 274 cases selected for study of unilateral and bilateral involvement, 68 (24.81 per cent) of the neoplasms were bilateral, and of all those who had bilateral tumors a much larger proportion (44.11 per cent) had died than of all those who had unilateral

tumor (17.96 per cent). Here again the relatively small proportion of deaths among those who had papillary cystadenoma is conspicuous.

Furthermore deaths in one and two years were in smaller proportion (50.05 per cent) among the 37 patients who had unilateral tumor than among the 30 (76.66 per cent) who had bilateral tumor. Therefore, death of patients with bilateral involvement occurred earlier.

#### RECURRENCE IN THE REMAINING OVARY AFTER UNILATERAL OOPHORECTOMY

In view of the known tendency of these tumors to develop independently in both ovaries or to metastasize, after unilateral oophorectomy, to the remaining ovary, the incidence of recurrence of the disease, in cases in which only one ovary was removed at operation, was determined. There were 72 patients with initially unilateral involvement, from whom only a single ovary was removed, and of these, 16 (22.22 per cent) later died of the malignant disease. Five died within one year after operation; one, within two years; 2, within three years; 4, within four years; one, within five years; one, within six years; one, within seven years; and one within more than nine but less than ten years.

Of the recurring growths in these cases, 7 were papillary cystadenomas; 4, carcinomatous cystadenomas, and 5, solid adenocarcinomas. On the other hand, the incidence of recurrence among cases in which bilateral oophorectomy was performed was relatively almost as high as that among cases in which only one ovary was removed: among 67 cases in which bilateral oophorectomy was performed, there was recurrence in 14 (20.89 per cent). It would appear, therefore, that in this series the recurrence was the result of the malignant tendencies of the disease rather than of a too restricted surgical procedure. In general, however, it would seem wise to bear in mind the high incidence of bilateral involvement, as well as the high incidence of recurrence in the three types of ovarian adenocarcinoma under consideration. Nevertheless, preservation of the function of childbearing of the young patient, is a consideration. Of the 72 patients from whom only one ovary was removed, 12 (16.66 per cent) later became pregnant.

#### INTRACYSTIC AND EXTRACYSTIC GROWTHS

A malignant growth occurring within a cyst is thought, in general, to be less likely to recur than an extracystic growth. Therefore, cases in which there was no evidence of metastasis were chosen for study. In cases of intracystic tumor recurrence was less likely to develop than in cases of extracystic tumor. Nevertheless, the proportion of cases of intracystic tumor, in which there was recurrence, was somewhat higher (11.53 per cent) than was anticipated. There were 6 patients with ruptured cysts; 2 died and 4 lived. The data concerning these 6 patients are as follows: Two had papillary cystadenoma of whom one was living eighty months and one 111 months after operation; two had carcin-

omatous cystadenoma, of whom one was living sixty-one months, and one died forty-eight months after operation; two had solid adenocarcinoma occurring in a cyst, of whom one was living eighty months, and one died within five months after operation.

#### PSEUDOMUCINOUS CARCINOMATOUS CYSTADENOMA

Although pseudomucinous cystadenomas are usually classified as benign tumors, some of them contain definitely carcinomatous cells. Twenty-one such cases were included in this entire series. Of the 8 patients who had unruptured cysts of this type, 7 are living and one is dead. Of the 13 patients who had ruptured cysts with peritoneal involvement, 6 (46.15 per cent) are living and 7 (53.84 per cent) are dead. The length of life of those who died was as follows: 3 lived one year; one, two years; 2, four years; one, five years; and one, seven years.

This group of cases is of especial interest because, in spite of the low grade of malignancy from a pathologic standpoint, the ruptured growth tends to recur through implantation, and yields a relatively high mortality rate.

#### MALIGNANCY WITH ASCITES

Seventy-nine patients had ascites. Of these 79, 34 (43.03 per cent) were living and 45 (56.96 per cent) were dead at the time of the study. Therefore it is apparent that although the presence of ascites in general connotes an extension of the disease beyond the local lesion, and the mortality rate therefore is above the total average mortality rate (56.96 per cent as compared with 40.20 per cent) the rate when ascites is present is considerably lower than that when metastasis, without regard for the presence or absence of ascites, is present (56.96 as against 69.60 per cent). In those cases in which ascites was present without metastasis, the chance of survival would appear considerably improved over that in all cases of ascites, for the proportion of those surviving from three to ten or more years in the former group was 58.13 per cent, whereas, the proportion of those surviving from three to ten years in the latter group was only 43.03 per cent. The contrary is the case, however, when metastasis is evident, for the percentage of surviving patients dropped from 58.13 of those who had ascites without metastasis to 25 per cent of those who had ascites with metastasis whereas the mortality rate in the same respective groups increased from 41.86 per cent to 75 per cent. The significance of ascites would appear therefore to depend on the presence or absence of metastasis.

Of the cases in which there were ascites and metastasis, surgical operation was supplemented by roentgen therapy in all except 12. Of those patients who were not given roentgen therapy, 2 were living and 10 were dead at the time these data were gathered. From 1 to 10 courses of roentgen rays were given in each case in which they were applied; that is, an average of 2.5 courses was given to each patient.

PRESENCE OR ABSENCE OF METASTASIS IN RELATION TO MORTALITY  
AND LENGTH OF LIFE

A study was made of the mortality in the group of cases in which metastatic growths in the pelvis or abdomen were found at operation. There were 102 such cases; 48 of papillary cystadenoma, 17 of carcinomatous cystadenoma, and 37 of solid adenocarcinoma. Of these, 31 (30.39 per cent) were living and 71 (69.60 per cent) were dead at the time the study was made. Forty-nine patients had pelvic metastasis only. Of these, 19 (38.77 per cent) were living and 30 (61.22 per cent) were dead at the time the study was made. There were 53 cases in which there were abdominal as well as pelvic metastatic growths. Of these, 12 (22.64 per cent) were living and 41 (77.35 per cent) were dead at the time the material was gathered.

It may be readily observed that in this group of cases in which there was metastasis, again the papillary growths exhibited less malignant tendencies than either of the other two types. The chance of survival in cases of papillary cystadenoma with metastasis would appear from this study to be almost 1 to 1, whereas in cases of carcinomatous cystadenoma and solid adenocarcinoma the chance of survival with metastasis drops to 1 to 4, or less. However, even among the patients with growths of more malignant type, and who had pelvic and abdominal metastasis, 8 lived five years or longer, 5 of whom lived more than ten years. However, considering those who had both pelvic and abdominal metastasis, and those who had pelvic metastasis only, including all three types of malignancy, it should be noted that recurrence and death may occur after five or even ten years, as witnessed by the 7 cases in the series.

## SUMMARY AND CONCLUSIONS

The incidence by age of adenocarcinoma of the ovary is highest in the fifth or sixth decades of life. The average of the patients with papillary cystadenoma was forty-six and nine-tenths years; of those with carcinomatous cystadenoma, forty-six and seventy-three-hundredths years; and of those with solid adenocarcinoma, forty-eight and thirteen-hundredths years.

There are no characteristic symptoms of adenocarcinoma of the ovaries. Abnormality of ovarian function was apparent through disturbance of menstruation. Recent change in periodicity of the flow was present in 24.52 per cent of the cases; profuse flow (hypermenorrhea) was present in 28.94 per cent of the cases; scant flow (oligomenorrhea) was present in 24.12 per cent of the cases and metrorrhagia or bloody vaginal discharge was present in 19.6 per cent of the cases. Pain was an outstanding symptom in 52.6 per cent of the cases.

Length of life after operation and mortality for the series of 388 traced patients was as follows: 59.79 per cent were living and 40.20

per cent were dead at the time the study was made, three years or more after operation. The proportion dead at the time the study was made was lower among patients who had papillary cystadenoma (27.27 per cent) than among those who had carcinomatous cystadenoma (55.55 per cent) or solid adenocarcinoma (62.35 per cent).

Bilaterality was present in 24.81 per cent of the tumors without metastasis. A larger proportion of patients who had bilateral growths (44.11 per cent) was dead than of those who had unilateral growths (17.96 per cent). Length of life after operation tended to be shorter among those who had bilateral growths.

The proportion of deaths among those who underwent removal of only one ovary was 22.22 per cent and of those who underwent removal of both ovaries was 20.89 per cent. This is not a significant difference.

Intracystic malignancy was proportionately less likely to recur than extracystic malignancy. The percentage of deaths from recurrence of intracystic growths was 11.53 per cent as against 28.20 per cent from extracystic growths.

The proportion of deaths was high among cases of ruptured pseudomucinous cystadenoma with peritoneal involvement (53.84 per cent).

Of patients with ascites, 43.03 per cent were living and 56.96 per cent were dead at the time the study was made. The proportion of patients who were living was higher among those who had no apparent metastasis (58.13 per cent) than among those who had apparent metastasis (25 per cent).

Of patients who had metastasis, 30.39 per cent were living and 69.60 per cent were dead at the time the study was made. The proportion of patients who were living at the time the study was made was higher among those who had pelvic metastasis only (38.77 per cent) than among those who had both pelvic and abdominal metastasis (22.64 per cent).

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Bohler, E.: The Use of Pernocton in the Treatment of Eclampsia, *Bull. de la Soc. d'Obst. et de Gynéc.* 5: 359, 1932.

Bohler treated seven cases of eclampsia with pernocton and the results were highly satisfactory. In six cases convulsions ceased immediately. In contrast with this, the author mentions that among 47 eclamptic patients treated in his clinic by means of the Stroganoff routine convulsions ceased in only 19. Another advantage of pernocton is that it does not interfere with uterine contractions. A third factor in its favor is that venesection may be dispensed with. The blood pressure returned to normal in all of the seven cases.

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# BLOOD SUGAR FINDINGS IN ECLAMPSIA AND PREECLAMPSIA\*

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## PART I. BLOOD SUGAR FINDINGS IN ECLAMPSIA

THE current evidence<sup>1, 2, 3, 4, 5, 6</sup> regarding blood sugar changes in eclampsia is not in agreement. Nor do the deductions from blood sugar findings agree except in that usually there is a rise in blood sugar after eclamptic convulsions.

This investigation was undertaken in an attempt to examine the claims of Titus and his coworkers<sup>1, 2, 4</sup> regarding blood sugar findings in eclampsia.

Accordingly, it was decided to repeat their work by following their procedure both as to the method of collection of blood and its analysis, and as to the avoidance of treatment of patients, while under examination, except for the occasional use of morphine.

### LABORATORY PROCEDURES

*Preparation of Tubes for Collecting Blood Samples.*—Blood samples were received in test tubes, without lips, 150 by 18 mm., calibrated at 10 c.c., cleaned, rinsed with distilled water, and dried without sterilization. The anticoagulant-preservative mixture, sodium flouride, C.P., powdered (J. T. Baker), 10 parts and thymol, crystals (Merck, Reagent), 1 part, was prepared and used according to Sander.<sup>7</sup>

*Blood Sugar Determinations.*—One of us (H. B. W.) made every reported blood sugar determination in ignorance of the source and sequence of blood samples.

The procedure of Folin-Wu<sup>8</sup> was followed, modified by using 0.25 per cent aqueous solution of benzoic acid<sup>9</sup> in preparing stock and diluted glucose standards and, by substituting the modification of Haden<sup>10</sup> in the preparation of protein-free filtrates.

*Accuracy of Blood Sugar Determinations.*—All blood filtrates after Nov. 24, 1931, were examined in duplicate, that is, two 2 c.c. samples were removed from each protein-free filtrate, and were carried through to completion as two separate samples by one individual. Duplicates were read against appropriate standards in groups of four or five pairs, calculated in milligrams and averaged.

The maximum acceptable difference between duplicate determinations on one filtrate sample was limited to 6 mg.; the average of differences between all duplicate determinations was 1.34 mg. for 156 pairs of duplicates.

Errors shown to exist by Rothberg and Evans<sup>11</sup> were not corrected because it was necessary to be consistent in procedure with a technic,<sup>1, 2, 4</sup> the description of which includes no mention of any such corrections.

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Stander and Harrison,<sup>3</sup> after noting that "Colorimetric readings are notoriously subject to individual variations depending on the person taking the reading, . . ." state that ". . . readings of each individual were checked to within 0.5 of a scale unit." They continue: "We feel that as we have taken this unusual precaution our results should be regarded as accurate as can be obtained by the methods available at present."

On the assumption that by "0.5 of a scale unit" is meant 0.5 of a mm., exception is taken to this method of checking accuracy of results.

The adoption of such a standard of accuracy was purposely avoided in this work, because it was recognized that it introduces a variable error, in the final calculation in milligrams, which increases as the millimeter readings approach zero. This error becomes so large that it cannot be ignored in those readings that fall in the lower millimeter scale, that is, in those readings that indicate high blood sugar values.

No question is implied regarding the accuracy of the blood sugar findings of Stander and Harrison,<sup>3</sup> because all their readings, even at low millimeter levels, may have come well within the limits of 0.5 of a scale unit, that is, within 0.5 of a millimeter. However, the error that may arise from the adoption of a colorimeter scale unit as large as 0.5 mm. as a standard for judging accuracy in plunger-type colorimeter readings is obvious, and is shown in Table I.

TABLE I. BLOOD SUGAR

THIS TABLE SHOWS THE ERRORS IN MILLIGRAMS OF BLOOD SUGAR INTRODUCED, AT DIFFERENT MILLIMETER LEVELS, BY A DIFFERENCE OF 0.5 MM. IN COLORIMETER READINGS

COLORIMETER READINGS IN MM.	MG. 100 C.C.	ERRORS IN MG.
7.0	286	+20
7.5	266	
8.0	250	-16
9.5	210	+10
10.0	200	
10.5	190	-10
19.5	102.5	+2.5
20.0	100.0	
20.5	97.5	-2.5
29.5	67.7	+1.1
30.0	66.6	
30.5	65.5	-1.1

In proposing a method for delimiting errors in colorimetric blood sugar determinations, it is suggested that duplicate examinations be made from single filtrate samples and that the standard for checking consistency of results be one of milligrams rather than of millimeters. In this way technical errors are checked by duplicate examinations and a limit of allowable error is established by a milligram standard that remains fixed for all millimeter readings.

#### BLOOD SUGAR FINDINGS IN ECLAMPSIA

This study was begun in August, 1931. It includes the findings in seven cases of eclampsia as follows:

Case 1 (Chart 1) represents a patient who had 5 convulsions before admission to the hospital. This case shows fluctuations of blood sugar: a drop preced-

ing and a rise following each convulsion, the blood sugar remaining within the lower hyperglycemic levels, that is, between 119 mg. and 137 mg.

Case 2 is unsatisfactory since only a few readings were recorded. The pre-eclamptic blood sugar readings were mostly in the lower limits of normal and the blood sugar immediately following the convulsion was just above normal limits, and then, hyperglycemic and fluctuating, after venesection.

Case 3 (Chart 2) also shows low normal blood sugar readings in the preeclamptic period. The patient then unexpectedly had 2 convulsions in rapid succession fol-

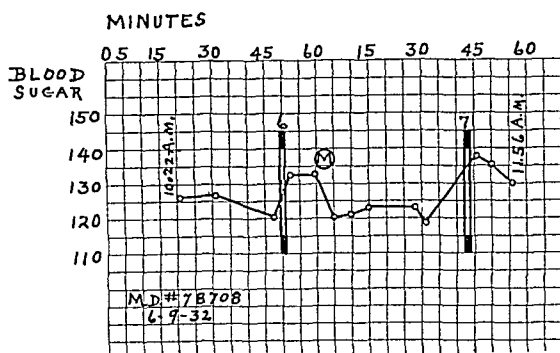


Chart 1.—Case 1, blood sugar curve in antepartum eclampsia. Case M.D. 78708 (6-9-32). M = morphine.

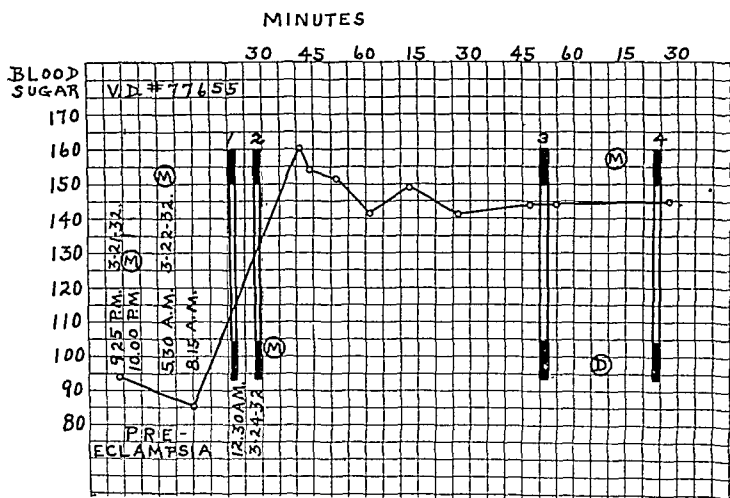


Chart 2.—Case 3, blood sugar curve in preeclampsia and intrapartum eclampsia. Case V.D. 77655 (3-21-32 to 3-24-32). M, morphine, D, delivered stillborn.

lowed by a marked rise to 160 mg. of blood sugar, which fluctuated, dropping to a level of 141 mg. to be followed by a third convulsion with only a slight rise to 143 mg. Delivery by low forceps was instituted at this point hence only one blood specimen was taken during this period. Hospital procedures prevented the taking of frequent blood specimens between the third and fourth convulsions. The blood sugar curve during this period, represented by the two samples taken, remained at the same level. The fallacy of drawing conclusions from infrequent specimens is illustrated by the curve during this period. This curve during the eclamptic period shows fluctuations in the blood sugar which all occur at hyperglycemic levels, at the same time showing a drop preceding the third convulsion.

Case 4 is the record of a patient who had 8 convulsions before admission to the hospital. She had an initial blood sugar of 198 mg. which fluctuated and fell to 161 mg. just before a ninth and last convulsion. This convulsion was followed by a rise to 187 mg. with slight fluctuations thereafter. This case showed fluctuations at hyperglycemic levels, a drop preceding and a rise following, the last convulsion.

Case 5 (Chart 3) is a record of a patient who had 5 convulsions before arrival at the hospital, and a sixth and a seventh convulsion soon thereafter. It was possible to collect only one specimen between these two convulsions. Avertin 60 mg. per kilo was given per rectum after which she had no further convulsions. She was delivered of a live baby the following day. Where frequent samples could be taken this case shows fluctuations and a fall in blood sugar before a convulsion, the blood sugar reaching lower levels soon after each convulsion.

Case 6 is that of a patient who had 3 convulsions before admission and a fourth on admission, with an initial blood sugar of 174 mg. which fluctuated,

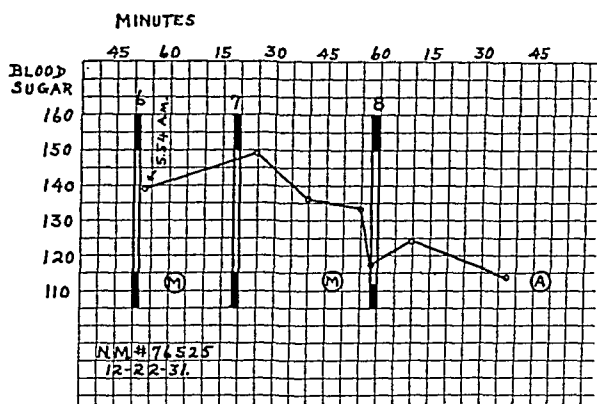


Chart 3.—Case 5, blood sugar curve in intrapartum eclampsia. Case N.M. 76525 (12-22-31). M, morphine, A, avertin, 60 mg. per kilo.

reaching the lowest level of 163 mg. preceding a fifth convulsion, following which the blood sugar rose to 175 mg. and gradually fell to 139 mg. Clinically the patient seemed to be improved and no further readings were taken, but one hour later she had a sixth and last convulsion. The patient showed a fall in blood sugar before, and a rise after, a convulsion, with a tendency to reach lower levels after each convulsion. All blood sugar findings were within hyperglycemic limits.

Case 7 is the record of a patient who was admitted to the hospital in labor as a normal case with a blood pressure of 126/85 at which time she was given morphine grains  $\frac{1}{4}$  to induce rest. She was delivered three hours and twenty-five minutes later. It was noticed that the patient was drowsy but this was thought to be due to the morphine. Unexpectedly six hours after delivery she had a convulsion and was in coma. Her blood pressure was 126/80 and slowly rose to higher levels. Fifteen minutes after this convulsion she showed an initial blood sugar of 115 mg. which gradually fell to 94 mg. The patient had no further convulsions and recovered. This patient had a normal, rather than hyperglycemic, blood sugar curve.

## SUMMARY OF FINDINGS IN ECLAMPSIA

These findings show (1) that fluctuations occur in the blood sugar in eclampsia; (2) that there is an increasing tendency toward the establishment of lower blood sugar levels after each convulsion; (3) that generally a fall in the blood sugar occurs preceding each convulsion and (4) that the majority of cases presented here show hyperglycemic rather than normal or hypoglycemic values.

This investigation confirms the fact that in order to find these changes, blood specimens must be taken at five, ten, or fifteen minute intervals during the course of the study.

## PART II. BLOOD SUGAR FINDINGS IN PREECLAMPSIA

In the course of this work there were studied 19 cases of preeclampsia. From most patients the blood sugar specimens were taken at the time of admission to the hospital and then daily following an overnight fast.

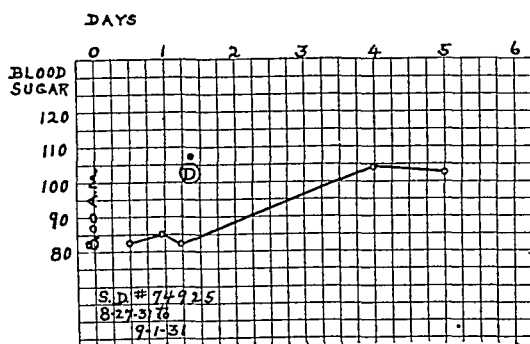


Chart 4.—Blood sugar curve in preeclampsia. Case S.D. 74925 (8-27-31 to 9-1-31). *D*, delivery by cesarean section at 4:00 P.M. on the second day. Blood pressure, 8-27-31, 178/120; 9-13-31, 118/74.

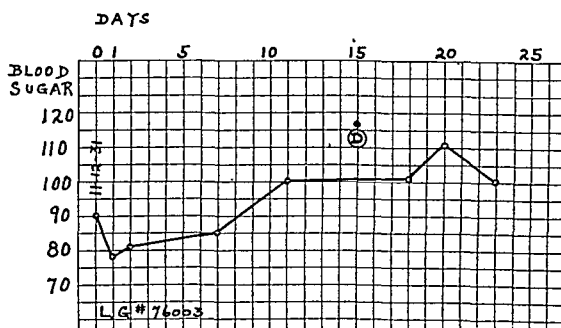


Chart 5.—Blood sugar curve in preeclampsia. Case L.G. 76003 (11-12-31). *D*, spontaneous delivery. Blood pressure, 11-12-31, 155/118; 12-9-31, 130/88.

Frequent specimens were not taken from these cases as from the eclamptic patients, otherwise the blood samples were collected and examined by the same methods as used for eclamptic specimens.

TABLE II. BLOOD SUGAR READINGS IN PREECLAMPSIA

	CASE NUMBER	CHAET NO.	BEFORE DELIVERY			AFTER DELIVERY		
			BELOW 80 MG.	BETWEEN 80-110 MG.	ABOVE 110 MG.	BELOW 80 MG.	BETWEEN 80-110 MG.	ABOVE 110 MG.
Group I	75610	—		81, 84, 86, 96			Eclampsia	
	77655	—		94, 85			Eclampsia	
	78344	—	79, 78	89, 85, 95, 91			102, 94	
	78375	—	72	97, 82			82, 86, 94, 93	
	78316	—	69, 71, 66				102, 75, 94, 82	
	75427	—	77				101	
	78166	—		85, 88, 82			97, 84, 91	116
	74925	4		84				114, 113
	75079	—	66	83, 85, 83		79		
	78023	—		81		74		
	76003	5	77	90, 82, 85, 100			103	
	77949	—	72, 77	80, 87, 84			84, 91	
	78115	—		84			101, 100	111
Group II	75830	—	65				82, 85	
	77024	—	73	93, 85, 101			98, 101	113
	76471	6	75, 68	89, 82			90	
Group III	70224	—	70, 60, 69				Not delivered	
	74759	7					Not delivered	
	76313	8		98, 81, 102	147, 130		Not delivered	

Titus and coworkers<sup>4</sup> state: "work now under way in this clinic but still incomplete indicates that hypoglycemia is much more pronounced and is an even more constant feature of preeclampsia, than it is after the sugar values have been disturbed by convulsions."

This study now presents conclusive evidence of the great frequency and preponderance of low normal or subnormal blood sugar levels in preeclampsia.

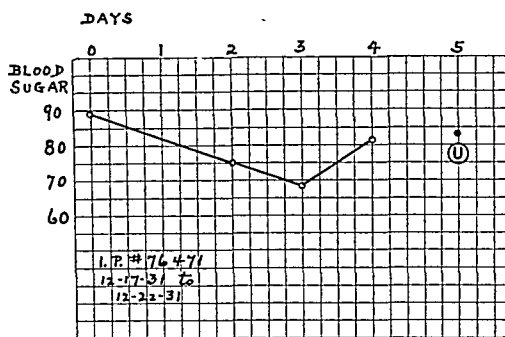


Chart 6.—Blood sugar curve in preeclampsia. Case I.P. 76471 (12-17-31 to 12-22-31). U, discharged undelivered. Blood pressure, 12-17-31, 190/114; 12-22-31, 130/80.

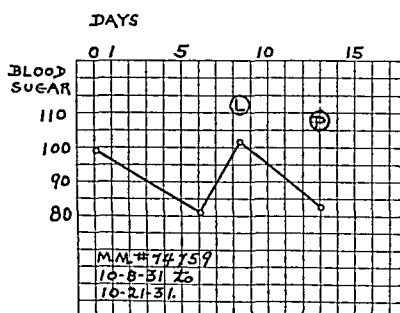


Chart 7.

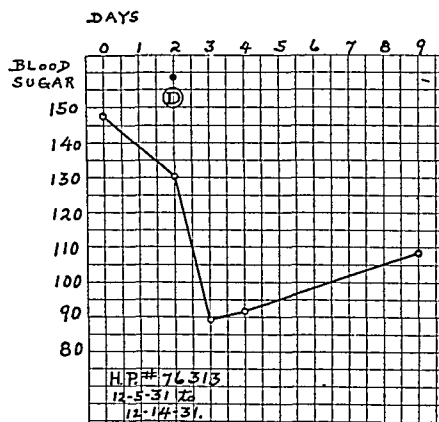


Chart 8.

Chart 7.—Blood sugar curve in preeclampsia. Case M.M. 74759 (10-8-31 to 10-21-31). L, in labor, P, postpartum. Blood pressure, 10-8-31, 150/100; 10-26-31, 138/88.

Chart 8.—Blood sugar curve in preeclampsia. Case H.P. 76313 (12-5-31 to 12-14-31). D, delivered. Blood pressure, 12-5-31, 150/100; 12-16-31, 122/88.

Cases 2 and 3 reported in Part I represent the 2 cases of preeclampsia which developed eclampsia. In both of these cases the readings preceding the first convulsion were in the region of low normal and only after the convulsion did the blood sugar rise and show wide fluctuations.

Charts 4 and 5 are representative of the blood sugar curves of 11 of the cases of preeclampsia (Group I, Table II) which before delivery were all in the region of low normal with many readings subnormal, that is, below 80 mg. per 100 c.c. of blood, while after delivery the blood sugar readings assumed more normal levels in most cases. Blood specimens were taken before and after the patients were delivered.

Chart 6 is representative of blood sugar curves of 3 cases (Group II, Table II) that improved under treatment. They were discharged from the hospital undelivered. This chart shows low readings with the tendency to assume more normal levels as the patient improved.

Chart 7 (Group III, Table II) is atypical in that it shows normal readings but at the same time these readings are not at a constant level. It is difficult to draw any conclusions from it except that possibly it is an indication of an unstable carbohydrate mechanism that may exist in this disease.

Chart 8 (Group III, Table II) is another atypical blood sugar curve in that the patient before delivery had a mild hyperglycemia which changed after delivery to normal blood sugar levels. Here again the findings are suggestive of an unstable carbohydrate mechanism in preeclampsia with a readjustment after delivery.

In Table II are listed all the blood sugar readings found in 19 preeclampsia cases. The normal variation for the Folin-Wu method is generally accepted as from 90 to 120 mg. per 100 c.c. of blood. In this study a range of from 80 to 110 mg. was taken as the normal variation. This table shows the preponderance of subnormal or low blood sugar levels in preeclamptic cases before delivery; whereas, after delivery the great majority of readings lie within the normal average figures. Hyperglycemia is relatively infrequent in preeclampsia.

#### GENERAL CONCLUSIONS

1. There is some disturbance in carbohydrate metabolism in eclampsia and preeclampsia as evidenced by the changes in percentage of blood sugar.

2. Fluctuations in blood sugar occur in eclampsia.

3. Eclamptic convulsions are generally preceded by a fall in blood sugar, which is often one of "relative hypoglycemia."

4. Usually there is a temporary rise in blood sugar following a convulsion.

5. After each succeeding convulsion there is an increasing tendency toward the establishment of lower blood sugar levels.

6. Hyperglycemia occurred in the majority of eclamptic patients studied in this series, although normal and hypoglycemic values were found.

7. In preeclampsia low normal or subnormal blood sugar is characteristic; as the patient improves under treatment or by delivery the blood sugar assumes more normal levels.

8. In the two cases of preeclampsia as represented by Charts 7 and 8, the atypical blood sugar findings suggest an unstable carbohydrate metabolism.

9. Proof is offered that colorimetric readings checked to within 0.5 mm. are subject to error.

The authors wish to express thanks to Ruth C. Vanden Bosche for the careful preparation of tubes for the collection of blood samples.

## REFERENCES

- (1) *Titus, Paul, Dodds, Paul, and Willetts, E. W.*: AM. J. OBST. & GYNEC. 15: 303, 1928. (2) *Titus, Paul, and Willetts, E. W.*: AM. J. OBST. & GYNEC. 18: 27, 1929. (3) *Stander, H. J., and Harrison, E. P. II., Jr.*: AM. J. OBST. & GYNEC. 18: 17, 1929. (4) *Titus, Paul, Willetts, E. W., and Lightbody, H. D.*: AM. J. OBST. & GYNEC. 19: 16, 1930. (5) *Laferty, John M., Nark, J. A., and Sweeney, J. J.*: AM. J. OBST. & GYNEC. 17: 113, 1929. (6) *Laferty, John M.*: AM. J. OBST. & GYNEC. 22: 637, 1931. (7) *Sander, F. V.*: J. Biol. Chem. 58: 1, 1923, 24. (8) *Folin, O., and Wu, H.*: J. Biol. Chem. 41: 367, 1920. (9) *Folin, O.*: Laboratory Manual of Biological Chemistry, New York, 1926, D. Appleton & Company, p. 263. (10) *Haden, R. L.*: J. Biol. Chem. 56: 469, 1923. (11) *Rothberg, V. E., and Evans, F. A.*: J. Biol. Chem. 58: 435, 1923, 24.

## AUTOTRANSPLANTATION OF PLACENTA TO THE ANTERIOR CHAMBER OF THE EYE AND ITS EFFECT ON LACTATION\*

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THE literature is lacking in reports of transplantation of placental tissue to the anterior chamber of the eye. Frankl<sup>1</sup> has transplanted whole placentas to the subcutaneous tissue in mice, and has obtained successful transplants. He found the transplants grew for a period of three to four weeks, after which they degenerated and were absorbed. Neuweiler<sup>2</sup> grew human placental tissue in various culture media and determined that the stroma grew most vigorously, the Langhans cells grew well but he was not convinced that the syncytium partook in the growth.

Transplantation of other tissues to the anterior chamber of the eye was done by Schochet,<sup>3</sup> who utilized homoplastic transplants of ovary, and observed them to persist for eight weeks. Allen and Bauer<sup>4</sup> made endometrial transplants to the anterior chamber of the eye in rabbits, obtaining a successful implantation in 44 out of 50 eyes implanted. Their transplants continued viable for fourteen months. Schochet<sup>5</sup> later produced experimental endometriosis by the transplantation of sensitized endometrium to the anterior chamber of the eye in guinea pigs. He utilized transplants treated by various agents to further proliferative changes, as his untreated transplants showed no proliferative growth other than cyst formation in a few cases. The transplants in his series remain viable for three to seven months after transplantation to the anterior chamber. Allen<sup>6</sup> studied the proliferation of endometrium transplanted to the anterior chamber of the eye in rabbits and found uterine epithelium to proliferate more readily than did other implanted substances. His implants were removed at intervals of time up to thirteen months.

Contradictory reports have appeared in the literature concerning the effect of the placenta upon the secretion of milk. Frankl in his transplantation experiments found that those pregnant mice in which a successful placental transplant had been made gave birth to litters all of which died because of the persistence of colostrum,

\*Read before the Chicago Gynecological Society, February 17, 1933.



and the absence of true milk from the mammary glands of the mother. Frankl concluded, therefore, that the placenta prepares the breast for secretory function, but inhibits the actual secretion of true milk. Stimson<sup>7</sup> showed that retained placenta in the human being may inhibit or delay milk secretion, and that if the retained placental tissue is removed, the milk secretion quickly develops to the normal level. Cornell,<sup>8</sup> however, has used prepared placental tissue of cows by mouth as a galactagogue, and believes that it has a favorable effect in the production of milk. Hammet,<sup>9</sup> studying the functions of the internal secretion of the placenta states that although there is no apparent stimulation leading to an increased supply of milk there was exerted upon the secretory function of the mammary gland an influence tending to raise the level of protein and lactose production with a decrease in fat metabolism.

The present study of autotransplantation of placental tissue to the anterior chamber of the eye was undertaken with several points in mind; first, to determine whether or not placental tissue will grow in the anterior chamber of the rabbit's eye; second, to observe the rate and details of the growth macroscopically and microscopically; and third, to determine whether or not the amount of transplanted and growing placental tissue has an effect upon the secretion of milk from the mammary glands of the host.

*Methods and Technic.*—In this series, 22 autotransplants of placenta to anterior chamber of the eye were made in 15 pregnant rabbits. The rabbits used were in various stages of gestation, although effort was made to obtain those pregnant from five to twenty days. After shaving the abdomen and cleansing with iodine and alcohol, anesthesia was induced by ether, care being taken to obtain light anesthesia. A midline abdominal incision was made, and one horn of the pregnant uterus identified. One fetus with placenta was delivered through a hysterotomy incision. The placenta was immediately placed in warm physiologic saline solution while the uterine incision and peritoneum were closed. The eye into which the implant was to be made was cleansed by a drop of 1 per cent mercurochrome, and a stab incision made through the conjunctiva and cornea into the anterior chamber. One or more pieces of placenta about 2 mm. square were cut from the fresh specimen, including the entire thickness of the placenta. Several such pieces could be utilized in most instances. These were slipped into the anterior chamber of the eye by means of fine forceps, usually without difficulty. The eyelids were not closed by suture, although in some cases they were clamped closed for a few minutes. The abdominal wall was then closed in layers with fine catgut suture and the skin closed with black silk continuous suture. This method of implantation closely follows that of Allen and Bauer, and was found simple and effective. The implants were easily inserted and extrusion was noted in only two cases, and in these cases was not complete. In 2 cases the implantation was unskillfully performed and vitreous humor was seen to escape after the stab incision into the anterior chamber was made. These cases were not considered in the subsequent study.

The animals were returned to their cages immediately after operation and were observed daily. Early in the study morphine was used to quiet the rabbits and to prevent abortion, but this was later deemed unnecessary as the tendency to abortion seemed slight. No animals aborted immediately after operation, the earliest delivery of a litter being five days after transplantation was done. Two litters were not born until twenty-two days after the operation, the average time of delivery being sixteen days after transplantation.

When the eyes were desired for microscopic study the animals were killed with ether and the eyes immediately enucleated. The bulbs were fixed in Mueller's solution, blocked in celloidin, sectioned, and stained with hematoxylin and eosin. In order to obtain a series of histologic preparations, eyes were removed at various periods after transplantation. Eyes were removed four days, thirteen days, and thirty days after operation respectively, and others still later. Three transplants were still visible twenty-six months after implantation, and were removed for microscopic study.

For the purpose of determining the effect of the transplantation upon lactation, it was necessary first, to ascertain whether or not the mammary glands of the implanted animals elaborated milk as do normal glands, and second, to determine whether or not milk, if formed, was obtained by the young in the normal manner. To determine the power of the glands to elaborate milk, several implanted animals which had given birth to litters were examined. The mammary glands were dissected out and opened and their contents subjected to macroscopic and microscopic examination, and compared with normal controls. To observe whether the young of the implanted animals obtained milk as did normal controls, the stomachs of several of the young were opened immediately after they had been observed to suckle. The stomach contents were then compared macroscopically and microscopically with contents obtained in an identical manner from the young of nonimplanted rabbits used as controls.

*Results.*—Of 22 autotransplantations considered, there were 20 successful "takes" and 2 which were considered macroscopically as unsuccessful. In the case of the successful implants there was uniformly noted a marked clouding of the anterior chamber about twenty-four hours after implantation. This clouding persisted for a variable period of time, usually for several days, and was often accompanied by a secretion of white flocculent material upon the conjunctival surface. Four to six days after operation there could be noted development of small blood vessels from the limbus or iris which entered into the transplant, and at this time hyperemia of the conjunctiva was noted. The secretion became less and disappeared in the majority of cases, although in 3 cases repeated irrigation with 10 per cent neosylvol was necessary. From this stage on in the successful cases, the implants increased in size and their vascularization became more noticeable. Such implants remained grossly viable as long as forty-eight days after transplantation. Transplantations which were to be unsuccessful showed slight cloudiness of the anterior chamber within twenty-four hours, but both clouding of the chamber and secretion on the conjunctival surface were less marked than in the successful cases. Vascularization of the implants was not noted in the unsuccessful cases and within four to five days the implants had diminished in size and were noted only as small white patches or flecks within the anterior chamber. After ten days they were visible only as hazy masses and remained as such for variable periods of time, after which they disappeared almost entirely. Total disappearance, however, was not noted, and an implanted eye could always be recognized by a haziness within the anterior chamber and the clouded scar of incision in the conjunctiva and cornea. Increasing intraocular pressure was not a prominent feature in this series, although in a few instances difficulty in placing the implants was experienced, due to fluid pressure within the anterior chamber.

In interpreting the microscopic sections of the implanted placenta, it must be remembered that branching villi protruding finger-like into maternal blood sinuses do not exist in the placental structure of the rabbit. Chipman<sup>19</sup> has shown that the rabbit placenta is formed of two portions, fetal and maternal. The fetal portion consists of trophoblastic tissue in the form of tubules, each tubule separated from its fellow by a connective tissue septum. In the axis of each tubule is a channel filled with maternal blood coming from the maternal sinuses which are situated in the maternal portion of the placenta. The tubules are closely set upon the maternal portion in such a fashion that the "mouths" of the tubules rest upon it. This maternal portion is composed of large decidual cells rather closely packed and sometimes markedly vacuolated.

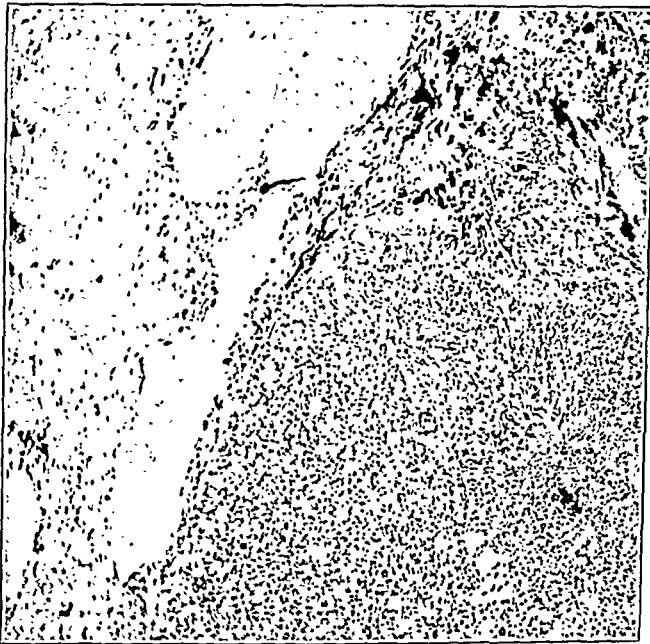


Fig. 1.—Normal rabbit placenta near full term. To right, fetal placenta (trophoblast); to left, maternal placenta (decidua), with large blood spaces.

The maternal sinuses are situated deeper in the uterine tissue. Separation of the placenta takes place normally in the deeper layer of the decidua, where a zone of degenerated decidua can be observed as the placenta nears maturity.

In the implants, therefore, we may expect to see trophoblastic masses of the fetal portion, or the decidual cells of the maternal portion, or both of these elements, depending upon which elements survive the transplantation better, or which grow more vigorously after transplantation.

It should further be noted that the physiologic life of the placenta in the rabbit is from twenty-six to twenty-eight days. It is natural, therefore, to expect that the life of implanted placental tissue would not

greatly exceed this period of time unless the implanted tissue should assume the characteristics of a malignant growth, and show evidence of this malignancy on histologic examination.

*Microscopic Results.*—*Four days after implantation No. 80:* The section showed a moderate sized implant lodged partly within the cornea and partly penetrating into the anterior chamber. The implant was broken up in places, had degenerated somewhat, and was infiltrated with polymorphonuclear leucocytes. In one place the end of the iris was involved in the implant, being pinched between two portions of it and drawn up into the corneal incision. The structure of the implant showed it to be made almost entirely of fetal placenta (trophoblast). The edges of the implant stained faintly and appeared necrotic in places, but were well demarcated and showed no evidence of a malignant type of invasion. There were many small blood vessels in the iris adjacent to the implant and some could be seen in the implant proper.

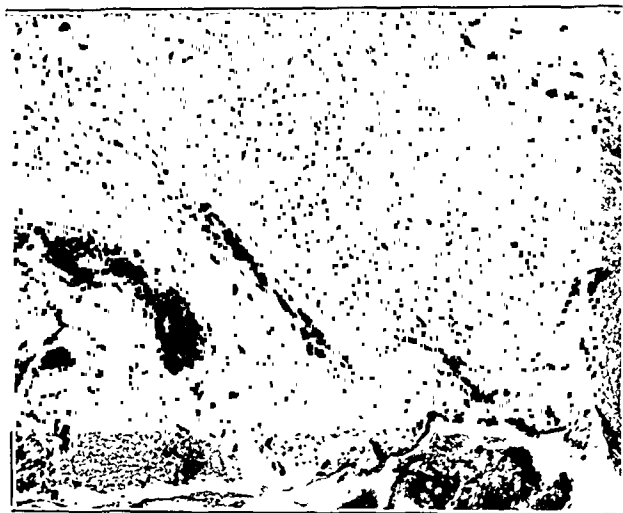


Fig. 2.—Placental implant four days after implantation, showing fetal placenta lodged next to iris. Slight necrosis of implant at edges.

*Thirteen days after implantation No. 180:* The section showed a break in the cornea through which a large implant had grown, filling the anterior chamber and attaching itself to the iris on one side. At this point it had grown into the iris to a considerable extent, scattering the iris pigment widely throughout the section. The implant had undergone some degenerative changes and was markedly infiltrated with blood in places but in other places showed the structure of fetal placenta (trophoblast). The implant rested upon the anterior surface of the lens and had in no place broken through, although it had extended anterior to the iris and filled almost the entire anterior chamber. The iris to which the implant had attached itself showed many dilated blood vessels, although none could be seen in the implant proper.

*Thirty days after implantation No. 80:* The section showed a small portion of the implant lodged in a cleft in the cornea at the point of incision. This implant was well preserved and was entirely made up of fetal placenta (trophoblast). Deep in the anterior chamber, and extending behind the iris lying directly upon the anterior surface of the lens was a large implant, made up entirely of trophoblast with a moderate polymorphonuclear infiltration scattered throughout it. The implant

was well demarcated and at no place broke through the anterior surface of the lens. It had attached itself only slightly to the iris and did not invade the iris. There was considerable free blood within the trophoblastic tissue.

*Forty-eight days after implantation No. 110:* The section showed a large implant adherent anteriorly to the posterior corneal surface, involving one portion of the iris anteriorly, and extending well into the anterior chamber. The entire implant stained faintly, did not show cellular structure, and was thickly infiltrated with leucocytes. In its deeper portions, the implant stained very faintly and homogeneously, and there were areas where the stain was not taken at all. The entire picture was one of necrosis of the implant and infiltration with leucocytes.

*Five months after implantation No. 2A-40:* This section showed the anterior chamber to be entirely empty, there being no evidence of implant. The iris was somewhat shrunken and shortened on both sides and the cornea showed on its outer surface an area of proliferating cells which might be considered the scar of implantation, but there was no further evidence of the implant.



Fig. 3.—Implant thirteen days after transplantation. Cornea above, anterior lens below. Scattered fetal placenta growing into iris at left, scattering iris pigment. Moderate necrosis throughout implant with blood infiltration. Dilated blood vessels in iris (left).

It was thus noted that the implants grew actively from shortly after implantation to thirty days after implantation. The eye removed forty-eight days after implantation showed necrosis and evidence of death of the implant. Those implants which were allowed to remain for longer periods all showed, when removed, varying degrees of necrosis and evident removal from the anterior chamber, so that, in the case of implants allowed to remain in situ for many months, there was no remaining placental tissue visible when the eyes were microscopically examined.

In 5 cases, the breasts of implanted animals were dissected out and opened. This was done from five to seven days after the birth of a litter in every case. In all cases the abundant amount of white fluid obtained from the breasts was compared microscopically with normal rabbit milk and found to be identical in every respect.

In 5 cases the stomach contents of the young of implanted mothers was examined immediately after the young had been observed to suckle. The selected young were removed from the breast after having been allowed to suckle for several minutes, were immediately sacrificed by kill-

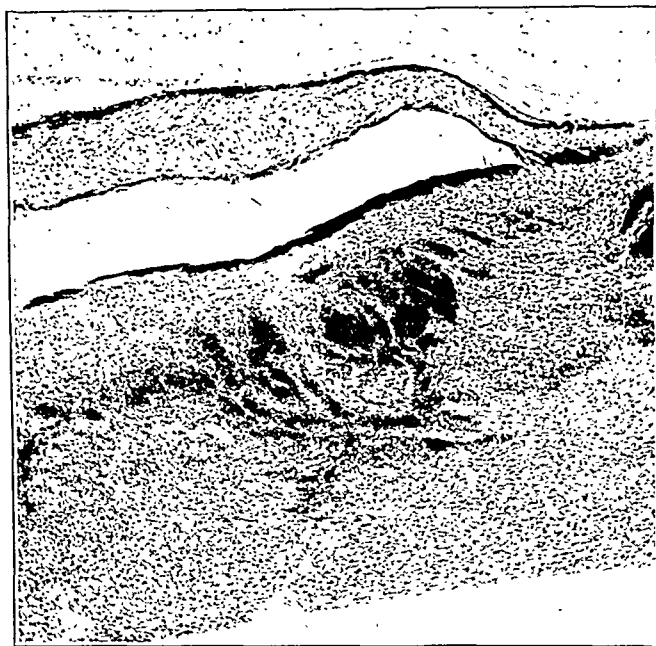


Fig. 4.—Thirty days after implantation. Large implant filling anterior chamber. Iris above implant. Fetal placenta only makes up the transplant. No evidence of invasive growth.

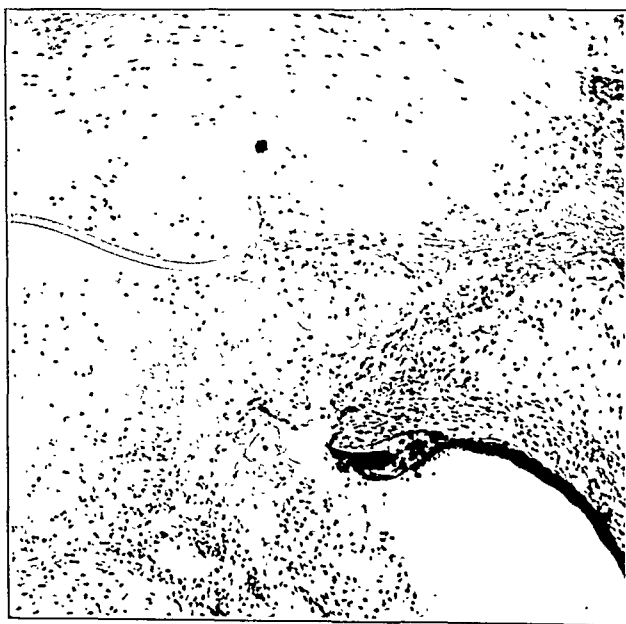


Fig. 5.—Forty-eight days after implantation. Entire implant necrotic without visible structure. Cornea above, iris to right.

ing with ether, and the stomach ligated at cardiac and pyloric ends and removed. The stomachs were then opened and the contents compared with stomach contents of normal young of unimplanted mothers. In all cases the milk found in the stomachs of the young of implanted mothers was identical with that of the control young.

*Conclusions.*—The following conclusions seem justifiable from this study:

1. Autotransplantation of placental tissue to the anterior chamber of the eye in rabbits is accomplished with a high percentage of success. The placental implants attach themselves to structures within the anterior chamber, usually the iris, and derive a blood supply sufficient for their maintenance from these structures. The implants grow readily for a period of approximately thirty days, after which gradual degeneration occurs. After death of the implants necrosis and absorption accounts for their entire removal from the anterior chamber.

2. Fetal placenta (trophoblast) alone takes part in the growth after transplantation. There is no evidence to show that the maternal elements (decidua) persist in the implants.

3. There is no observable tendency for the implanted placenta to undergo malignant change, or to exhibit any indication of invasive growth.

4. Amounts of placental tissue which may be transplanted to the anterior chamber have no effect upon the formation or secretion of milk in the host.

#### REFERENCES

- (1) *Frankl, O.*: AM. J. OBST. & GYNEC. 6: 399, 1923. (2) *Neuweiler, W.*: Monatschr. f. Geburtsh. u. Gynäk. 77: 437, 1927. (3) *Schochet, S.*: Surg. Gynec. Obst. 31: 148, 1920. (4) *Allen, Edward, and Bauer, C. P.*: Surg. Gynec. Obst. 47: 329, 1928. (5) *Schochet, S.*: AM. J. OBST. & GYNEC. 17: 328, 1929. (6) *Allen, Edward*: AM. J. OBST. & GYNEC. 23: 343, 1932. (7) *Stimson, C. M.*: AM. J. OBST. & GYNEC. 4: 413, 1922. (8) *Cornell, E.*: Surg. Gynec. Obst. 27: 535, 1918. (9) *Hammet, F. S.*: Endocrinology 3: 307, 1919. (10) *Chipman, W.*: Studies from the Royal Victoria Hosp., Montreal 1: 227, 1902.

185 NORTH WABASH AVENUE.

#### DISCUSSION

DR. EDWARD ALLEN.—Dr. Litt did not mention Markee's work. There is evidence of a definite cyclic change in the endometrium according to this author. I have transplanted tubes that also showed this cyclic change.

DR. EMIL RIES.—When we transplant skin from one human being to another human being however closely related, father to son, son to father, etc., it may take perfectly and last for a varying period of time. At the end of that time the grafted skin comes off in identical ratio to the new skin formed by the recipient under the graft. The patient's own skin grows in from the edges and dislodges the graft and it falls off as a thin pellicle. That surface may have been grafted with twenty pieces and yet the outline of those pieces is invisible. On the other hand, when you graft the skin of an individual from one area of his body to another, that grafted skin will stay there and is not supplanted. The patient's own skin will not grow under his own skin and, at the end of five years you can see the outline of each and every one of the grafted pieces as I have demonstrated repeatedly.

This has some bearing on placental tissue grafted into the eye of the mother. The fact that the placental tissue undergoes atrophy is evidence that it is tissue foreign to the mother. The reason why this placental tissue atrophies and is lost is that it is foreign, and conversely the observation shows to what extent the placenta is foreign to the mother.

DR. A. G. GABRIELIANZ.—I understand that several of the experimental animals in which transplantations were done were pregnant and that these rabbits aborted in sixteen days. Do you assume that these rabbits delivered at term or did they abort after transplantation of placenta?

DR. LITT (closing).—I am familiar with Markee's work but did not mention it because I thought it had no direct bearing on my work. In regard to the cyclic changes that were observed in his work, there was nothing in the way of cyclic or vascular changes observed in these placentas. I had not thought of implanting the placenta into the young because I was interested in the problem of the effect of implantation upon the secretion of milk in the host in the attempt to confirm Frankl's original work. It is certainly true that fetal placental tissue is foreign tissue to the mother and in that respect might grow for a longer period and more vigorously if implanted into the eye of the newborn animal.

There were no abortions after implantation. The earliest delivery of a litter was five days after implantation. This litter was full term and lived and, therefore, was not considered as an abortion. The other deliveries were from five to twenty-two days after implantation and the average of all deliveries was sixteen days after implantation.

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Goecke, H.: *The Use of Pernocton in Eclampsia*, *Monatschr. f. Geburtsh. u. Gynäk.* 88: 170, 1931.

A comparison is made by Goecke of 34 cases of eclampsia treated with pernocton and 40 other cases in which pernocton was not used. In the pernocton series only 4 had convulsions after delivery as compared with 9 cases in the series in which pernocton was not employed. No injury to the child due to pernocton was observed. Neither were there any instances of hyperexcitability which is frequently seen when pernocton is used to produce twilight sleep and after gynecologic operations. Pernocton did not reduce blood pressure hence in the cases where the blood pressure remained elevated after delivery, venesection was performed.

The author mentions that in spite of the use of pernocton he still favors emptying the uterus as early as possible, especially by cesarean section. Pernocton therapy is especially indicated in postpartum eclampsia, likewise in cases where after delivery, convulsions seem imminent.

J. P. GREENHILL.

Harding, Victor J., and Van Wyck, H. B.: *Effects of Hypertonic Saline in the Toxemias of Later Pregnancy*, *Canadian M. A. J.* 24: 635, 1931.

Although the authors were unable to produce albuminuria and increased blood pressure in normal pregnancies, both could be increased, even with convulsions occurring, in the gravid toxemia patient by the administration of hypertonic saline solutions. By bed rest and salt-free mixed diet the findings largely subsided only to be increased again after sodium chloride readministration. Sodium bicarbonate has, in their experience, had a comparable influence, probably due to a sodium chloride retention. They maintain that the retention or abnormal distribution of water is caused by these salts. Proteins are harmless while salt restriction is a necessary part of prenatal care. Hypertonic saline solutions are contraindicated in all obstetric toxemias, even postoperatively, since such therapy may be disastrous.

H. CLOSE HESSELTINE.



# THE FALLACIES OF TRICHOMONAS VAGINALIS VAGINITIS

## I. STREPTOCOCCI AS THE ETIOLOGIC AGENTS

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NOTWITHSTANDING reported observations and numerous recommended therapeutic procedures, very little has been done to determine the pathogenicity of these trichomonads. For this reason a preliminary report is made of experimentation with the vaginal flagellates, which indicates that the vaginal trichomonads live on bacteria and are possibly nonpathogenic. The technic for the separation of the flagellates and bacteria by the washing and the micromanipulation methods is described.

## SOURCE AND ACTION OF TRICHOMONADS

Speculations on the sources and species of the tetratrachomonads are conflicting. Lynch and Hegner believe that the vaginal and digestive tract flagellates are identical and that they may live in any of the hollow viscera, conditions permitting, while Kofoed, Stein and Cope, and others find variations between these. Perhaps these differences are not great, especially if it can be shown that the supposed cultural and morphologic variations are actually resulting from environmental factors, such as type and number of bacteria,  $P_H$ , etc.

Hegner, Kofoed, Hogue, and Hibbert indicate that a mixed or abnormal bacterial flora is associated with this disease, which findings are comparable to this series and the unreported cases from the University of Iowa. Hibbert and Greenhill state that transplanted vaginal discharge containing trichomonads did not produce the clinical entity, which means that the recipients were immune not only to the trichomonads but to all other pathogens contained in the discharge.

It is well established that patients suffering from "Trichomonas vaginitis" are prone to have recurrences, especially at or following the catamenia. It is equally well known that exacerbations of or extensions from gonorrheal cervical infections are often related to the menstrual period. By analogy, one might argue that the etiologic agents of "Trichomonas vaginitis" were bacteria with their foci in the deeper vaginal epithelium or in the cervical glands. Such infections present difficulties in effecting prompt and consistent cures.

EXPERIMENTAL DATA AND DISCUSSION

The most conclusive study in determining pathogenicity of vaginal flagellates would involve freeing the trichomonads from all bacteria, fungi and other infective agents, and transplanting them into the vaginas of uninfected women, and then being able to recover and identify the organisms after the disease has developed. If strict isolation proves impossible, proof of pathogenicity must rely upon indirect evidence, such as the production of the disease by bacteria commonly associated with the parasites, with the demonstration of the relationship between the bacteria

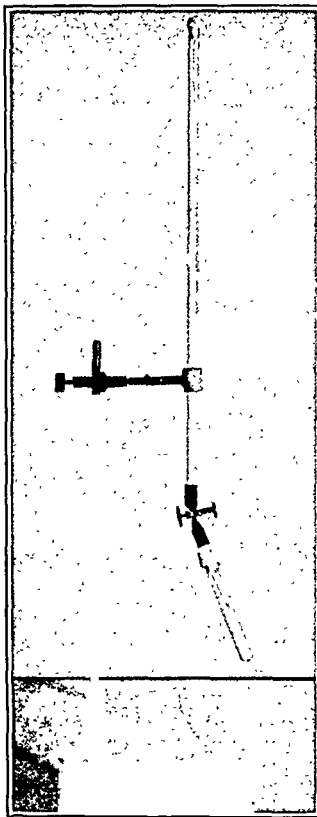


Fig. 1.—Apparatus (mounted as used) for washing by gravity.

and the trichomonads. Finally, it may be shown that neither the flagellates nor the bacteria by themselves are pathogenic, but that one group activates the other. It has been suggested that the whipping motion of the flagellae produces irritation, but in that event all flagellates should cause an irritation, even the spermatozoa. Inasmuch as the trichomonads are considered noninvaders, any possible pathogenicity must result from toxic substances formed by one of three processes: (1) Liberation from ingested bacteria, (2) production in holozoic activity, or (3) synthesis through holophytic behavior. So far, none of these properties has been demonstrated.

For the past several months, attempts have been made to separate the trichomonads from bacteria, but failure has occurred in every instance, as the flagellates disintegrate within forty-eight hours and leave behind no living bacteria. This indicates that the trichomonads probably destroy the bacteria by ingestion. Cleveland observed that *T. faecalis* could not subsist in the absence of bacteria. In order to show that the methods used by the writer to isolate the protozoa did not

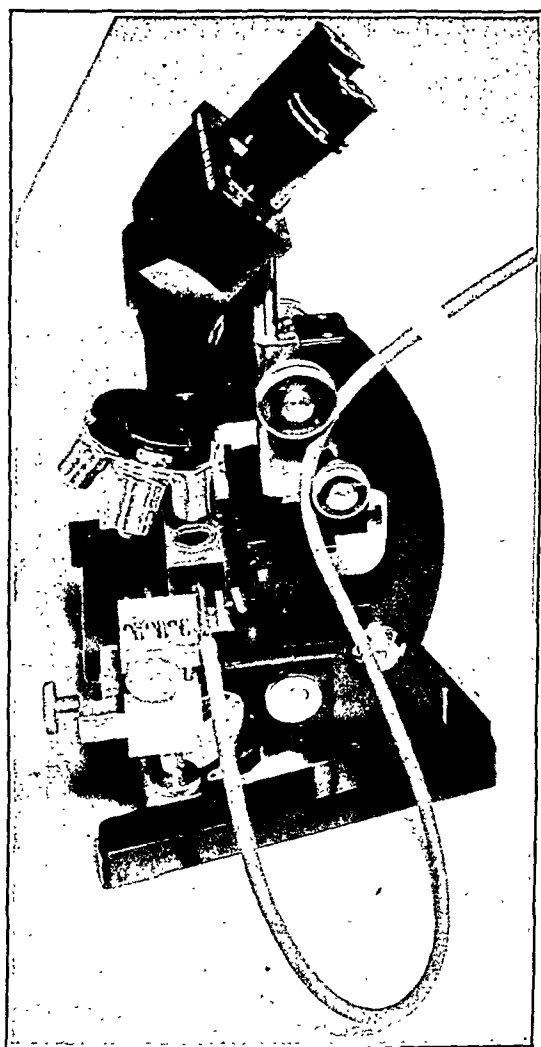


Fig. 2.—Micromanipulator (arranged as used), moist chamber, and pipette with capillary tip.

damage these organisms, bacteria were occasionally added to the cultures, which resulted in growth of the trichomonads.

Various techniques have been suggested and used in separating microscopic organisms, but, for this study, the washing method, by the use of gravity, proved easier and more reliable than the single-cell isolation with microcapillary pipettes and micromanipulation. The techniques for both methods are briefly as follows:

*The Washing Method.*—A 100 cm. glass tube, 1 or 2 cm. in diameter, is used, with a stopcock or its equivalent at the bottom (Fig. 1). The vaginal discharge is collected in a sterile test tube and one to ten drops are placed on the surface of the full column of Locke's solution. The equipment is kept at room temperature. At two and one-half minute intervals, after five minutes have elapsed, four to ten drops of the suspension are collected from the bottom into the sterile test tube. Each specimen is agitated and one drop is examined for the presence of flagellates.

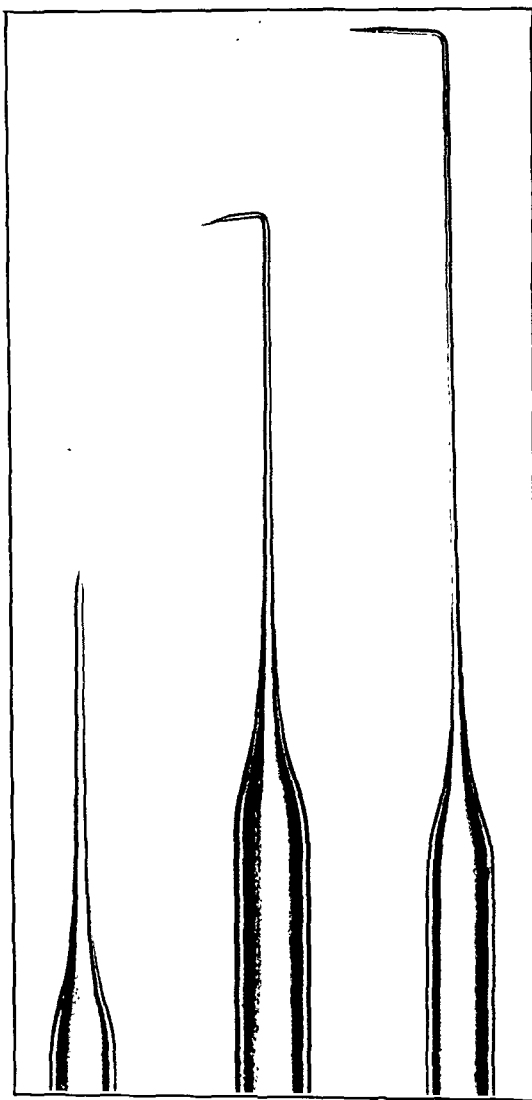


Fig. 3.—Type of microcapillary pipette employed.

From the first specimen containing flagellates, a loopful is added to each of two culture tubes (Locke's solution with 5 per cent human serum and a few red cells). One tube is incubated without further contamination, while bacteria, either in pure culture or separated from the vaginal cells, debris, and protozoa by medium fine Berkefeld filters, are added to the second tube. Whenever flagellates grew in the first tube, bacteria were found in the original smear of the inoculum as well as in the culture. Furthermore, when these organisms failed to live, bacteria were not found.

*Micromanipulation.*—For the single-cell isolation by micromanipulation, a modified Barber apparatus (Fig. 2) was employed. A moist chamber (Fig. 2), made from square copper tubing and having surfaces the size of a standard glass slide, was used. On one side and closer to the left end there is one large circular opening the width of the tube, and directly opposite this is a smaller opening, over which a cover slip may be placed so that a hanging drop may be suspended within the compartment. The pipettes (Fig. 3) are made of glass, with lumens varying from 20 to 50 microns in diameter. Aspiration is accomplished by a syringe or, after practice, the mouth may be used, freeing the hands. The pipette is placed in the apparatus, with its bent tip pointing upward in the center of the field, and is then lowered out of the visual field. A drop of diluted vaginal discharge on a cover slip is mounted on the chamber. The field is studied until a trichomonad, apparently free from bacteria externally, is found (several dilutions may be necessary). The chamber is moved so that the flagellate is over the pipette end, after which the pipette is elevated until it enters the field of vision, when slight aspiration is made, drawing the organism into the pipette. To prevent capillary action the small portion of the pipette is filled in advance with Locke's solution. After catching an organism, the pipette is removed and its contents transferred to a culture tube. The process may be repeated as often as necessary, with new sterile equipment.

Since they reproduce asexually by longitudinal binary fission, a single uninjured flagellate should be sufficient for each culture. The controlled cultures indicate that when bacteria are added the organisms are able to live. Many cultures have been made without controls, but so far the trichomonads have failed to grow in the absence of bacteria (Table I).

If the vaginal trichomonads are nonpathogenic, some other form of infection must exist to produce the symptoms. In an attempt to find possible foci of infection, a study has been made on clinic patients with vaginal trichomoniasis at the Chicago Lying-In Hospital.

TABLE I. SURVIVAL OF VAGINAL TRICHOMONADS IN MODIFIED LOCKE'S MEDIUM WITH AND WITHOUT BACTERIA

TRICHOMONADS ISOLATED FROM VAGINA OF PATIENT	WITHOUT BACTERIA (WASHING METHOD)	WITH BACTERIA (CONTROL)
1	Died within 24 hours	Lived
2	Died within 24 hours	Lived
3	Died within 24 hours	Lived
4	Died within 24 hours	Lived
	(Cell isolation—micromanipulation)	
5	Died within 24 hours	Lived
6	Died within 24 hours	Lived

In one year there were 87 such patients (Table II), of whom 78, or 90.8 per cent, had cervicitis or endocervicitis, or persistent sinuses at the apex of the vagina, following total hysterectomy; 3.4 per cent had no cervical lesions and 5.7 per cent did not have a complete examination. This high incidence of cervical infection corresponds closely to Klegman's<sup>14</sup> finding.

While endeavoring to obtain the trichomonads in pure culture in sufficient number for inoculations, other organisms were used in an at-

tempt to produce the clinical picture (Table III). The bacteria employed were gram-positive nonhemolytic, pleomorphic streptococci, selected because they were consistently present in abnormal vaginal flora of trichomoniasis. Maryan's work shows that chronic cervical infection is produced usually by streptococci having characteristics of those employed in this study. Nine different strains were used, the first three cultures being from sources other than trichomoniasis, although they appeared to belong to the same general group; the remaining six were isolated from the vaginal discharge of patients having trichomoniasis. The first five strains were established by colony isolation on blood agar plates, while the last four cultures were obtained by progressive dilution in dextrose brain broth. Isolation by dilution prevented, possibly, the organisms from losing their selective action.

Twenty-two pregnant patients (Table III) were treated by adding bacterial cultures directly to the vagina. In three instances, trichomonads were present in an abnormal vaginal flora before the inoculation, but subjective symptoms were absent and the only clinical change was a cervical erosion and an increased vaginal discharge. After the "treatment" one patient had an increased vaginal discharge, one showed no change, while in the third the clinical entity developed. In contrast, trichomonads appeared in the vagina of one patient (previously free

TABLE II. CLASSIFICATION OF PATIENTS WITH VAGINAL TRICHOMONADS

	GYNECOLOGY	OBSTETRICS	TOTAL
Cervical lesions	41 (Draining apical sinus following total hysterec- tomy in one)	38 (In three fungi were present)	79
No cervical lesions	3	0	3
Miscellaneous (Pelvic examination not complete)	4	1	5
Total	48	39	87

from the flagellate) after the bacterial transfer, yet no symptoms or clinical changes occurred. Among the remaining 17 protozoan-(vaginal) free patients who were inoculated, two developed vaginitis. One presented a typical picture, except that the discharge was not foamy, while the second had an atypical infection. In the entire group, vaginal discharge was increased in six, while in three, vaginitis developed within ninety-six hours after the inoculation.

The clinical condition, described as "trichomonas vaginitis," has been produced twice in the absence of trichomonads, and only once in their presence. Furthermore, it was produced by streptococci isolated on blood agar plates as well as through dilution in dextrose brain broth media. Table III indicates the strains and numbers of patients used.

TABLE III. THE PRODUCTION OF EXPERIMENTAL VAGINITIS CLINICALLY RESEMBLING "TRICHOMONAS VAGINITIS" WITH NONHEMOLYTIC STREPTOCOCCI

STREPTOCOCCI FROM PATIENT	METHOD OF ISOLATION	NUMBER OF PATIENTS INOCULATED INTRA-VAGINALLY	RESULTS		
			NO. WITH INCREASED DISCHARGE	NO. WITH "TRICHOMONAS VAGINITIS" ENTITY	
1. Without "Trichomonas vaginitis"	Blood agar plate	3	1	1	
2. Without "Trichomonas vaginitis"	Blood agar plate	3	1	1	
3. Without "Trichomonas vaginitis"	Blood agar plate	2	0	0	
4. With "Trichomonas vaginitis"	Blood agar plate	6	3	0	
		(Trichomonads appeared in 1 after inoculation)	(Trichomonads were present in 1 before inoculation)		
5. With "Trichomonas vaginitis"	Blood agar plate	1	0	0	
6. With "Trichomonas vaginitis"	Dilution in dextrose brain broth	2	0	0	
7. With "Trichomonas vaginitis"	Dilution in dextrose brain broth	1	0	0	
8. With "Trichomonas vaginitis"	Dilution in dextrose brain broth	1	0	0	
9. With "Trichomonas vaginitis"	Dilution in dextrose brain broth	3	1	1	
		(Trichomonads were present in 1 before inoculation, but no symptoms developed)		(Trichomonads present before inoculation)	
Total		22	6	3	

Since precautionary measures had to be followed throughout this study, it required many weeks to complete this series, necessitating the use of several bacterial strains in order to have new unattenuated cultures.

#### SUMMARY AND CONCLUSIONS

The clinical entity of "Trichomonas vaginitis" is undoubtedly produced by some infective agent, but the pathogenicity of the *T. vaginalis* Donn  has not been conclusively proved.

From the studies described above, it might be deduced that the trichomonas is not pathogenic, but further experimental work must be done before positive conclusions are warranted. The accurate determination of the status of these vaginal flagellates is needed before better therapeutic procedures can be expected. If the trichomonads are not pathogenic, our methods of treating this clinical entity may be materially improved. Until the significance of the trichomonas can be settled, it will be necessary to continue with the treatments that are producing the best results.

From the information obtained the following impressions are drawn:

1. The pathogenicity of *T. vaginalis* Donn  is still unproved.
2. Some of the fallacies of the arguments favoring pathogenicity of this protozoon have been mentioned.
3. Experimental findings indicate that the *T. vaginalis* Donn  is a scavenger and feeds upon bacteria.
4. *T. vaginalis* Donn  fails to grow in the medium used in the absence of bacteria.
5. Presumably, an abnormal vaginal flora, or the condition producing it, is a prerequisite for the invasion of the trichomonads.
6. A nonhemolytic streptococcus is capable of producing a "trichomonas vaginitis" in the absence of trichomonads.
7. Two methods for separating trichomonads from the bacteria are described.
8. Further studies are in progress to aid in establishing proof of the actual status of the *T. vaginalis* Donn .

An appreciation is extended to Dr. G. M. Dack for his advice in obtaining bacteriologic cultures.

NOTE: Bibliography is included in the author's reprints.



## A NEW CONCEPT OF THE MECHANISM OF VERTEX ENGAGEMENT IN SIMPLE FLAT PELVES

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TEXTBOOK descriptions of the mechanism of vertex engagement in simple flat pelves state that the head attempts to enter such pelves in the attitude of flexion as in the normal mechanism. They further state that the head (apparently referring to its biparietal portion) slips off to one side of the true conjugate, which is too short to permit of its passage, so that the narrower bitemporal region may be brought into relation with this diameter and the biparietal diameter brought into position in the larger space opposite the sacroiliac joint. Following this, the head is said to rotate into the transverse position, the biparietal portion becoming temporarily arrested at the inlet while the bitemporal diameter passes through the true conjugate by reason of the mechanism of deflection which permits the narrower frontal portion of the head to slip through the inlet. When this is accomplished the biparietal portion follows.

In analyzing the mechanism attention should be given to the following facts. In the first place roentgenopelvimetric studies of normal and simple flat pelves show that whereas the length of some of the antero-posterior diameters of the inlet lateral to the true conjugate may be as great as the true conjugate yet none is greater. The increase in their length posteriorly by reason of the concavity on either side of the sacral promontory is counterbalanced by a decrease in their length anteriorly due to the arching backward of the anterolateral border of the inlet (Fig. 1). These studies further show that the length of those diameters extending from the sacral promontory obliquely forward to the anterolateral borders of the inlet, roughly corresponding to the sacrocotyloid diameters, rarely equals the length of the biparietal cephalic diameter except in unusually large pelves. This fact is important because it is to such a diameter that the biparietal cephalic diameter is presented in an obliquely posterior position of the occiput. Another important fact is that the greatest available transverse diameters of normal and simple flat pelves usually exceed the lengths of either oblique diameters. Secondly, it is to be remembered that when the fetal head is in the attitude of normal flexion as opposed to that of acute or enforced flexion, its presenting circumference is irregularly oval, the long axis of this

ovoid being intermediate in length between the suboccipitobregmatic and occipitofrontal diameters whereas the widest transverse or biparietal diameter occupies an eccentric position nearer the occipital than the frontal end (Fig. 2). Therefore, unless some pathologic factor brings about a displacement of this presenting ovoid toward that side of the pelvis occupied by its frontal portion, the biparietal area is not normally presented for passage through the true conjugate and therefore cannot be displaced from a position it never occupied. Finally and most

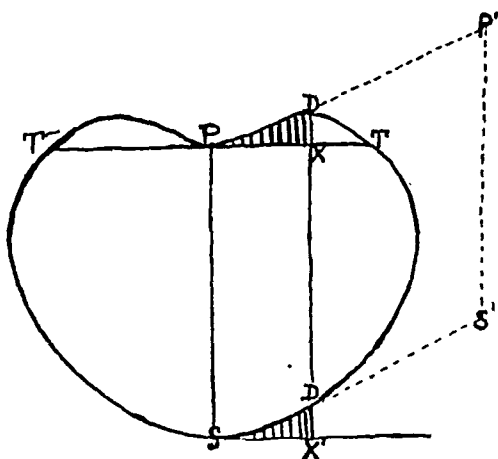


Fig. 1.

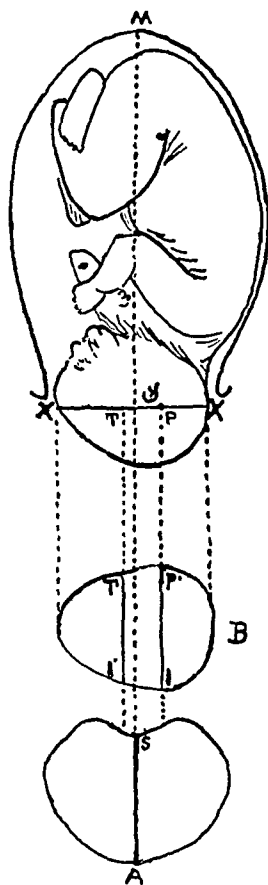


Fig. 2.

Fig. 1.—Diagram illustrates that contrary to past teachings there is no more room lateral to the true conjugate than is offered by the true conjugate itself. Then line *TT* represents a transverse diameter passing through the tip of the sacral promontory. *PS*, the true conjugate; *DD*, an anteroposterior diameter extending forward from the concavity lateral to the sacral promontory. The assumed increase in the length of *DD* over that of *PS* due to its prolongation, *XD*, posterior to the line *TT* is counterbalanced by the decrease *DX'* in its anterior extension.

Fig. 2.—*B* shows outline of fetal head in a coronal plane, *XX'*, passing through its biparietal and bitemporal areas (points *P* and *T*, top figure, and lines *P'I* and *T'I*, center figure). The projection of the outline of the presenting cephalic ovoid upon the outline of the pelvic inlet shows that normally the biparietal area lies lateral to the true conjugate.

important is the fact that a shorter cephalic diameter is presented for passage through the true conjugate when the head lies transversely than when it lies obliquely (Figs. 3 and 4).

Obviously, therefore, the usual descriptions of the mechanism convey erroneous and inadequate impressions of the size of the pelvis lateral to the true conjugate. They emphasize the importance of an assumed displacement of the fetal head and fail to attach proper significance to that phase of the mechanism which has as its object the rotation of the cephalic ovoid into the transverse position. We believe that the latter is the cardinal factor since it brings a shorter cephalic diameter into position for passage through the true conjugate than when the head

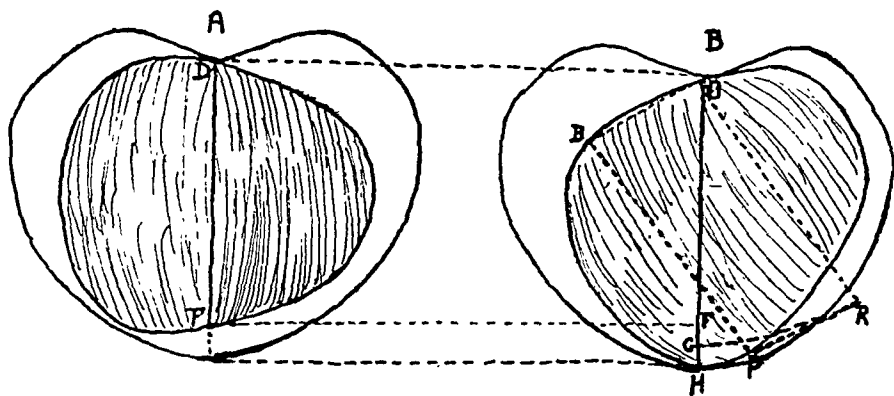


Fig. 3.—Showing relationship between the various diameters of a normal pelvic inlet and a normal sized head.  $B'P$ , biparietal diameter.  $PR$  and  $B'D$ , two equal and parallel lines.  $DR$  equal to  $B'P$ .  $RC$ , arc of projection of  $DR$  on  $DH$ .  $DC$ , therefore equal to  $B'P$ . The cephalic diameter which is presented for passage through the true conjugate in oblique positions of the head is greater than that cephalic diameter ( $DF$ ) which is so presented in transverse positions and is even greater than the biparietal diameter.

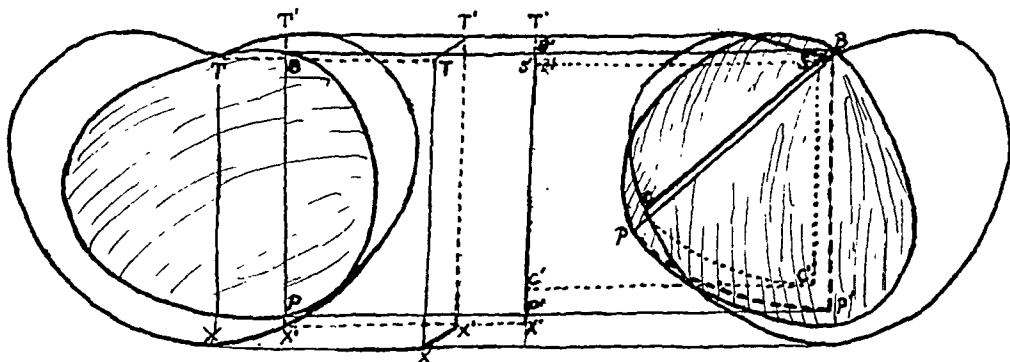


Fig. 4.—Shows relationship between the various diameters of a normal pelvic inlet and a normal sized head.  $TX$ , true conjugate;  $T'X'$ , anteroposterior diameter extending forward from sacroiliac chondrosis and equal in length to  $TX$ .  $BP$ ,  $BP'$  and  $B'P'$  represent length of biparietal cephalic diameter.  $SC$ ,  $SC'$ , and  $S'C'$  represent length of sacrocotyloid diameter. In flat pelvis almost similar relationships exist except that  $BP$  may exceed  $TX$  and  $T'X'$ .

lies obliquely. Unless the head is pathologically displaced this particular diameter will be the bitemporal. This rotation at the same time enables the head to utilize the greatest available diameters of the inlet which as mentioned in a previous paper are the true conjugate and obstetric transverse diameters and which together determine the size of the inlet.\*

\*Stude, W. C., and Scherman, V. E.: AM. J. OBST. & GYNEC. 23: 524, 1932.

In line with the foregoing we offer the following as our impressions of the mechanism under discussion. As the head approaches the inlet in an obliquely posterior position of the occiput, the biparietal diameter is the first to become arrested, since the sacrocoityloid diameter is too short to permit of its passage. Immediately upon this arrest deflection occurs because the downward force of the uterine contractions is exerted through the center of the cephalic ovoid causing rotation of the head

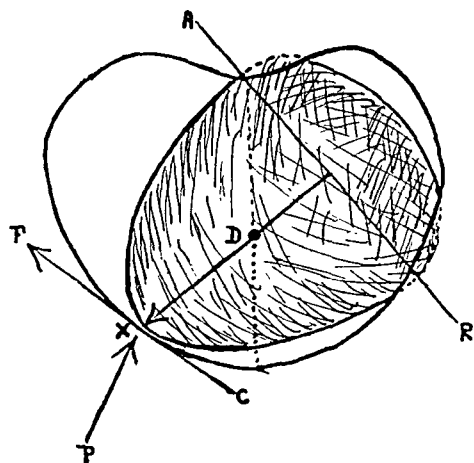


Fig. 5.

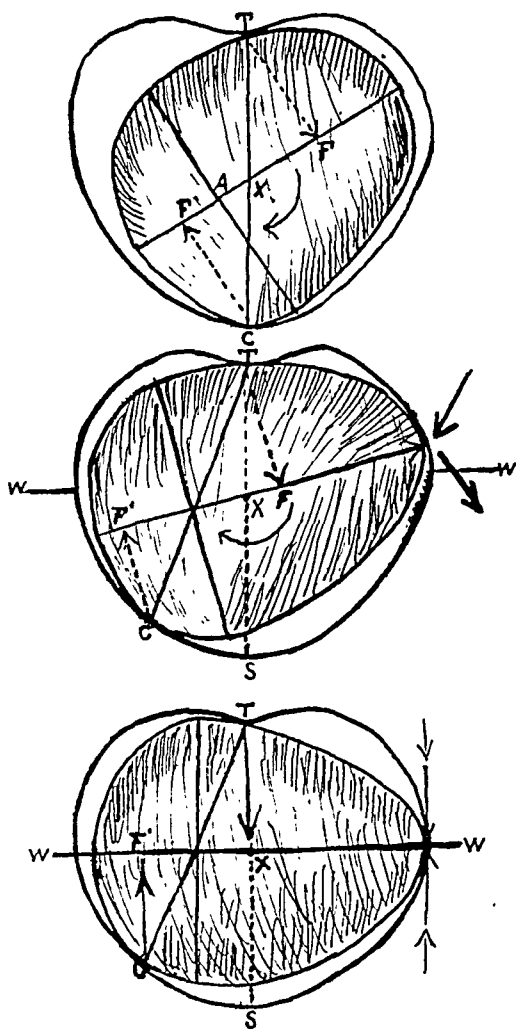


Fig. 6.

Fig. 5.— $AR$  represents axis of resistance about which head rotates and undergoes deflection, thereby causing the frontal area to meet the pelvic resistance at  $X$ . From this point it is caused to rotate posteriorly by the component  $CF$  of the forces  $PX$  and  $QX$ .

Fig. 6.—Illustrates the mechanism whereby an oblique anterior position of the occiput is converted into a transverse position at the inlet as explained in the text. W.W., line of greatest transverse diameter.

around an axis represented by the eccentrically situated biparietal diameter. In this process of deflection, the long axis of the cephalic ovoid is increased and the frontal portion of the head comes to meet the

resistance of the anterolateral border of the opposite side of the pelvic inlet since the oblique diameter is not long enough to permit the passage of this cephalic diameter. To the force which the frontal portion of the head is now exerting against the anterolateral border of the inlet there is added a counterforce exerted by the pelvis. The component of these forces serves to direct the frontal area of the head in a posterior direction along the anterolateral margin of the inlet until the head occupies a transverse position (Fig. 5). In this, its bitemporal diameter is presented for passage through the true conjugate while its biparietal diameter is presented for passage through an anteroposterior diameter extending forward from the concavity lateral to the sacral promontory, this diameter being usually as great as the true conjugate but not greater. Up to this point we believe the mechanism to be the same for flat pelvis and normal pelvis except in the case of especially large varieties of the latter in which it would be possible for the head to enter as L.O.P. or R.O.P.

In obliquely anterior positions of the occiput, resistance is first offered the head by the true conjugate (Fig. 6). Deflection does not immediately occur because the downward force of the uterus is exerted through the center point ( $X$ ) of this line. Rotation around a vertical axis passing through this point is the first mechanism. It is effected by a transmission to the long axis of the presenting cephalic ovoid of the forces exerted at the points of resistance (indicated by lines  $TF$  and  $CF'$  Fig. 6 top). As soon as sufficient rotation has occurred to cause a shift of the line of resistance away from the true conjugate (Fig. 6 center) the downward force of the uterus (exerted through  $X$ ) causes deflection of the head around this new axis of resistance (line  $TC$  Fig. 6 center). There results a lengthening of the long axis of the cephalic ovoid, the frontal portion of which strikes against the posterolateral border of the inlet. The latter in turn exerts a counterforce in such a manner that the component of these two forces causes the frontal area to rotate anteriorly to the transverse position. Up to this point it aids the original direction of rotation but beyond this point, or more correctly, anterior to the greatest transverse diameter of the inlet, the component force affecting the frontal area is in the opposite direction. Therefore all forces concerned in causing rotation about a vertical axis neutralize one another when the head has been brought into the transverse position (Fig. 6 bottom). This mechanism does not necessarily occur in obliquely anterior positions of the occiput associated with very large pelvis since in them the true conjugate may be sufficiently long to permit of the passage of that oblique cephalic diameter which is presented to it.

After rotation to the transverse position the mechanism of engagement in flat pelvis is the same regardless of whether the occiput was originally obliquely anterior or posterior. Further deflection occurs and the narrow frontal portion of the head descends first, thereby bringing

the head into the attitude of a more favorably compressible wedge in relation to the inlet. The counterforces exerted by the latter may now be transmitted to the biparietal region from a direction better suited to effect molding, after which descent of the biparietal area occurs.

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## OBSERVATIONS UPON ADYNAMIC ILEUS\*

### WITH REPORT OF A CASE

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PARALYTIC ileus may be defined as a motionless distention of the intestines, due to a paralysis of the muscular tunic of the bowel. It is adynamic in type, that is, there is moderate to extreme distention of part or all of the intestinal tract in the absence of any obstructive lesion. It is therefore necessarily differentiated from the mechanical or dynamic type of ileus, in which there is a definite mechanical obstruction along the course of the bowel, due to spasticity of the muscular tunic, occlusion of the lumen of the bowel from without or within or by volvulus, strangulation or herniation.

The factors concerned in the production of paralytic ileus are generally accepted as being both interference with the blood supply of the bowel, particularly the venous return, and stimulation of the abdominal sympathetic nerves whose action is inhibitory to bowel peristalsis.<sup>1</sup> Stimulation of the parasympathetic nerves excites intestinal motility. Simultaneous stimulation of both sympathetic and parasympathetic elements leads to a domination of sympathetic or inhibitory group, and a motionless intestine results.

The exciting causes of intestinal inertia and subsequent distention may be either extraabdominal or intraabdominal. Among those occurring extraabdominally are (1) the psychic factor, from prolonged or excessive stimulation of psychic origin, which inhibits both secretory and motor functions of the gastrointestinal tract. (2) Pulmonary factor: The inertia and distention seen in acute processes, such as pneumonia, may be due to infective agencies, but are probably circulatory in origin. (3) Cardiac factor. The distention is due primarily to venous stasis. (4) Renal factor. Involvement of this retroperitoneal organ may induce ileus by reflex sympathetic stimulation.

Intraabdominal exciting causes of inertia and distention may be briefly considered as follows: (1) Prolonged intraabdominal operations, resulting in loss of heat or body fluids, badly given anesthetics, rough

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handling of the tissues or too much pressure exerted on the bowel by packs. Any or all of these factors may operate in causing sympathetic stimulation and ultimate venous stasis. (2) Prolonged strangulation of bowel or mesentery, cutting off the blood and nerve supply. May be permanent if too long a time elapses between the time of strangulation and its surgical correction. (3) Septic or inflammatory lesions, the most common variety due to local peritonitis with an arrest of peristalsis. As the infection spreads and becomes generalized the inertia and distention increase in proportion. Before the distention is great enough to cause venous stasis and ileus of the paralytic type, the ileus may be regarded as an active ileus, a physiologic mechanism intended to insure rest of the abdominal contents and to check spread of the infection. (4) Embolism and thrombosis. Involvement of such veins as the superior mesenteric and the portal lead to serious consequences as a result of impairment with the venous return.

The clinical picture of the patient suffering from paralytic ileus differs slightly according to whether the exciting cause is inflammatory or traumatic.<sup>5</sup> In the inflammatory type hyperperistalsis is seen early, later disappearing. There is marked distention with acute colicky pains, with nausea and vomiting, intermittent at first and later persistent. Early the vomitus represents the stomach contents, but as the pyloric sphincter is paralyzed the vomitus becomes fecal in character. The facial expression is one of apprehension, the cheeks are flushed, the tongue is parched and brown, there is marked dehydration and great thirst, and the bowels are obstinately constipated. The pulse is rapid but full and the temperature mounts from the beginning. There is moderate to marked leucocytosis depending upon the resistance of the patient.

The noninflammatory, nonbacterial, traumatic or reflex type of paralytic ileus gives rise to the same picture in most essentials. It differs, mainly, in the following details: (1) Severe colicky pain is not constant. (2) The distention is more marked and peristalsis is absent from the beginning. (3) The nausea and vomiting are persistent. (4) The temperature remains flat until the toxic products begin to be absorbed. (5) Leucocytosis is marked from the beginning.

Generally the picture is one of profound toxemia, with some of the symptoms of shock.<sup>4</sup> The prostration is great; the vomitus is dark and foul, and is regurgitant in type. There is a fall in blood pressure and late in the disease the pulse becomes weak and thready. The skin is moist and clammy. As the toxemia advances the patient shows evidence of cerebral irritation, manifested by muscular twitchings, and occasionally tetany. Ultimately a comatose state develops. There is suppression of urine, occasionally leading to an anuria. Obstinate constipation is the rule and frequently copious bowel evacuations signify impending death.

Blood studies by McVicar<sup>6</sup> have revealed the following important findings: (1) There is a rise in blood urea, a fall in the blood chlorides, and a rise in the CO<sub>2</sub> combining power of the plasma. (2) By a study of the chemistry of the blood, the condition can be recognized early, the severity can be measured, and the progress of treatment watched. (3) Tetany may be anticipated when the CO<sub>2</sub> combining power of the plasma is found to be above 100 volumes per cent. (4) All cases show a tendency to alkalosis, and the use of alkalis in the treatment is contra-indicated.

As to the cause of death, Sims<sup>5</sup> advances three possibilities, starvation, toxic absorption, and fatigue of the nervous system. Estrem claims that there is a bacterial change, both proteolytic and putrefactive; also a primary proteose poison formed by the perverted activity of the gastrointestinal mucosa.

Hausler and Foster have advocated the theory of a shock complex rather than the formation of toxic substances.

#### TREATMENT

*A. Preventive.*—Prophylactic measures are very important, especially in postoperative cases. General and local rest are essential. General rest is prompted by morphia or other opium derivatives. Local rest is favored by the application of a tight binder, which immobilizes the abdominal wall and thus lowers the incidence of ileus.

The gastrointestinal tract is kept at rest by restricting fluids by mouth and by avoiding the use of purgatives. Especially is this important in inflammatory cases, or where there has been much manipulation of bowel or trauma to the tissues. The Fowler position promotes relaxation of the abdominal walls and encourages gravitation of any inflammatory effusions or exudates to the pelvis. Food should at first be light; over-eating or solid food favors distention.

*B. Active.*—*Fluids:* Because of the vomiting there is a tendency toward dehydration. Since the stomach is intolerant, the fluid loss is compensated for by the administration of fluids by vein, skin, and by rectum. Glucose intravenously aids in combating starvation.

*Gastric lavage* is indicated in cases of persistent vomiting and gastric dilatation. A successful lavage will lessen upper abdominal distention and favors the return of intestinal circulation.

*Drugs:* Gray, Wells,<sup>7</sup> and others employ pituitrin hypodermically in the hope of diminishing abdominal distention. Guthrie<sup>3</sup> regards its use as dangerous. Eserine is often used. Wells uses it in doses of gr.  $\frac{1}{18}$  every hour for 4 doses. Martin and Weiss employ eserine with success in nontoxic cases. Pituitrin acts on the muscle cells, increasing tone and causing peristalsis. Eserine, on the other hand, acts on the vagus endings stimulating the bowel to contract.



*Surgery:* Guthrie<sup>3</sup> recommends enterostomy when spinal anesthesia fails, or for an aggravated case of adynamic ileus. Gray<sup>1</sup> advocates enterostomy when other methods fail, favoring ileostomy or jejunostomy. If enterostomy fails, Estrem<sup>4</sup> attributes the failure to an unwisely chosen site. Enterostomy, to be successful, must drain the liquid toxic content of the bowel. McVicar<sup>6</sup> holds that relief is dependent more on the decompression of the paralyzed bowel than on the removal of toxic intestinal contents. Such decompression allows the bowel to regain sufficient tone to start up normal peristalsis.

*Spinal Anesthesia.*—This is rapidly gaining popularity. Studdiford<sup>9</sup> says: "The probable explanation of the effect of spinal anesthesia in ileus is that the splanchnic inhibitory reflexes are blocked so that the vagus motor reflexes have full play." Neely<sup>10</sup> quotes Pitkin on the succession of events following the administration of spinal anesthesia: "With distention or paralytic ileus, a high anesthetic will produce gurgling in five minutes; gas is passed in eight to ten minutes, and a copious evacuation will occur within fifteen or twenty minutes. The abdomen becomes soft and distention disappears: an effectual therapeutic remedy."

*Chloride Administration:* The normal blood chloride range in whole blood is 450 to 520 mg. per 100 c.c. blood. In adynamic ileus there is a reduction. Nelsen injects 600 c.c. of 3 per cent sodium chloride in the pectoral muscles in mild cases. In severe cases he supplements this with 3 to 5 per cent NaCl and 5 to 10 per cent solution of glucose. Wells<sup>7</sup> claims good results from the intravenous administration of 40 c.c. of 20 per cent NaCl, and repeated in four to six hours. Hughson and Scarff use larger doses intravenously, giving as much as 60 to 70 c.c. of a 20 per cent solution of NaCl at a time.

The following case report is illustrative:

Mrs. T. Z., aged thirty-two (Kensington Hospital for Women). On admission her chief complaint was colicky pain in the epigastrium. She complained of much indigestion since the birth of only child nine years ago, accompanied by severe attacks of rumbling pain in epigastrium. Symptoms much more constant and severe for a month preceding admission. During this past month has been markedly constipated and several times has taken enemas with failure of the enema material to return. Pain did not radiate, had no relation to meals. Much nausea and gas but no vomiting. Menstrual periods very irregular for past few years. Frequent amenorrhea from three to six months. Periods very painful and scanty. Last period six weeks before admission. No urinary, cardiac, or pulmonary symptoms.

Abdomen slightly distended, peristalsis normal. Fundus markedly retroverted and retroflexed, fixed, and slightly enlarged. Ovaries palpable but free and not enlarged. Urine, blood count, and blood chemistry normal on admission. X-ray picture along with clinical history led to suspicion of gallstones and a pelvic operation with exploration of gall bladder region was decided upon.

At operation a two months' pregnancy was found, with marked retroversion. No gallstones were found and gall bladder was emptied freely. Incidental appendectomy was performed. Uterus pushed forward manually. The following day patient was in good condition, but on the third day patient was cold and

clammy, had a subnormal temperature and other evidences of shock; abdomen was markedly distended, no peristalsis, slightly rigid in the right lower quadrant. However there was no vomiting but sharp stabbing pains in the epigastrium since early in the morning with occasional cramp-like pains in the lower abdomen thought due to contraction of the uterus. On the fifth day patient's pulse rate was up, no longer showed evidence of shock. Morphine relieved pain. However, abdomen was still markedly distended. No peristalsis present. Patient still had not vomited. Stomach lavage thought advisable and much thick, dark green mucous material obtained. Patient was given  $\frac{1}{2}$  c.c. of spinocaine with complete anesthesia of the lower three-fourths of body for period of one hour. After return of sensation, abdomen seemed slightly less distended, peristalsis again heard for the first time in thirty-six hours. On the sixth day patient's abdominal condition was not improved. Pulse still elevated, temperature 104.3°.

Following an enema she began having bowel movements and at 2:00 o'clock had had five large evacuations containing much fecal material, after which the condition became much improved, temperature fell, abdomen much less distended, pulse rate decreased. Previous to this time the patient had occasionally expelled gas both by mouth and by rectum, but after repeated enemas no fecal material had been obtained and the enemas given were returned with much difficulty. Stomach washed out and two quarts of pale yellow definitely fecal smelling material was obtained. Urinary output small for amount of fluid given. Clear serous discharge from wound.

On the seventh day patient's condition was decidedly worse, temperature steadily rising, abdomen again markedly distended; however, peristalsis was still present. Enema given with no return. Patient at times delirious. Jute tube was inserted into the stomach about 6:00 P.M. and left in for several hours. About four quarts of fecal smelling and appearing material obtained, after which there was a definite decrease in the amount of distention. Temperature 107°, pulse very weak and fast, condition very poor. Patient became delirious definitely about 2:00 A.M. Became so delirious at 6:00 A.M. that she had to be given morphine and scopolamine to quiet her. Continued with an impalpable pulse until time of death at 9:00 A.M. on the eighth postoperative day.

*Autopsy Report.*—When incision was opened about 500 c.c. of clear serous fluid exuded. Just underneath the skin was found small intestines greatly dilated which had broken through the peritoneal and fascial sutures but which were in no way discolored and showed no evidence of obstruction. The intestine was then followed beginning at the rectum up through the large bowel down to the cecum, where the appendectomy wound was found intact and clean, then along the small intestine, up to the stomach. The entire intestinal tract showed no evidence of obstruction and was generally dilated to about 5 cm. in diameter, filled with gas and watery fecal material, similar to that found on gastric lavage. Stomach found distended to about four times normal size and filled with similar fluid. Gall bladder was palpated and there were no stones and no evidence of infection. Pancreas felt soft, but not acute pancreatitis. Left kidney showed hemorrhagic spots on the outer surface and the cut surface showed evidence of acute nephritis, evidently terminal. Section taken from spleen appeared that of passive congestion. Uterus and tubes as found in operation. Diagnosis: Paralytic ileus, acute dilatation of stomach, and acute nephritis (probably terminal).

*Comment.*—This case of adynamic ileus was proved by autopsy to have occurred without peritoneal infection and without mechanical factors.

Analysis of the patient's history and preoperative findings discloses no demonstrable causal factor for the condition except a history of persistent and marked constipation together with gastric indigestion.

Spinal anesthesia did not appreciably reduce the distention although it produced a return of peristalsis and relieved the acute discomfort of the patient. In this instance it was of little value in differentiating between adynamic ileus and mechanical obstruction.

#### REFERENCES

- (1) *Gray, H. T.*: Brit. M. J. 1: 1161, 1930. (2) *Murphy, J. B.*: Murphy Clinics 3: 617, 1914. (3) *Guthrie, D.*: New York State J. M. 31: 1021, 1931. (4) *Estrem, C. O.*: Minnesota Med. 11: 83, 1928. (5) *Sims, G. K.*: Illinois M. D. 60: 51, 1931. (6) *McVicar, C. S.*: Am. J. M. Sc. 169: 222, 1925. (7) *Wells, J. E.*: J. Florida M. A. 18: 65, 1931. (8) *Ross, J. W.*: Canad. M. A. J. 16: 241, 1926. (9) *Studdiford, W. E.*: Surg. Gynec. Obst. 47: 863, 1928. (10) *Neely, J. W.*: Texas State M. J. 26: 357, 1930. (11) *Nelsen, M. T.*: Northwest Med. 28: 222, 1929.

1814 SPRUCE STREET.

## THE RELATIONSHIP BETWEEN GYNECOLOGY AND ORTHOPEDICS\*

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THE views and opinions given in this paper have been based on observations and deductions which I was able to make during my twelve years' association with one of the large orthopedic hospitals in the city, namely, the Hospital for Joint Diseases.

I shall refrain from citing case histories and devote attention entirely to general principles.

The relationship between gynecology and orthopedics is concerned chiefly with the differential diagnosis of the etiology of sacrolumbar pain. It was formerly believed that backache in women was solely due to gynecologic causes. Although Peiser<sup>1</sup> in 1912 emphasized the importance of sacroiliac and lumbar abnormalities as a cause of backache, gynecologists gave little heed to the subject. In 1919, Opitz and Matthes<sup>2</sup> presented an analysis of the causes of sacral pain in which they pointed out that the static dynamic mechanism and psychoneurologic factors play a prominent part in the etiology of backache. Still gynecologists did not give these causes the attention they deserved.

In recent years, however, there has been an increasing recognition of the fact that the problem presented by lumbosacral pain concerns not only gynecology but pathologic anatomy, surgery, orthopedics, and roentgenology. The belief that backache is always caused by disorders

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of the female reproductive system naturally brought the patient to the gynecologist, and thus the etiology of this symptom became peculiarly his problem. Certain gynecologists analyzed their case records to determine the frequency of sacral pain due to other than gynecologic causes. Various investigators attributed backache to gynecologic affections in from 30 to 80 per cent of the cases, Ward<sup>3</sup> placing the figure as high as 75 to 80 per cent. I<sup>4</sup> have always believed that the latter figure is too high, and more exact knowledge has now greatly reduced estimates of the relative importance of the so-called gynecologic backache.

Usually the gynecologist has attributed low back pains in women to retroversion and retroflexion, and to inflammatory conditions such as posterior parametritis, cervicitis, and prolapse; less frequently he has been able to prove that the pain is due to pressure from large fibroid tumors, incarcerated cysts, salpingitis, and carcinoma. Kark<sup>5</sup> expresses the opinion that while malpositions of the female pelvic organs occur in cases of low back pain, they are merely the accompaniment of structural and postural changes in the back. With this belief I am inclined in large measure to concur, though I would not detract from the importance of corrective gynecologic surgery. It is, however, essential that gynecologists bear in mind the fact that many conditions outside of the female generative apparatus may be involved in the production of low back pain, and it is to these that I would briefly call attention.

#### POSTURAL AND ANATOMIC FACTORS

A study of the static dynamic mechanism of the trunk-supporting structures clearly demonstrates that the muscular, cartilaginous, ligamentary and osseous structures constitute a functional unit. Any defect or inadequacy in any one of these involves all the others by shifting weight-bearing and dynamic function to points not designed to assume them. While every factor in the static dynamic mechanism intimately involves every other portion, for purposes of discussion these factors may be considered under the headings: (1) muscular tone, (2) function and pathology of cartilage, and (3) skeletal abnormalities and diseases.

1. *Muscular Tone*.—Loss of muscular tone is of primary importance in the production of both uterine displacements and orthopedic defects, since it influences directly or indirectly all portions of the trunk-supporting mechanism. In the healthy adult with a normally developed spine the curvatures are such as will allow the surfaces to take the bulk of downward pressure, and erect posture is maintained by the tone of the musculature without strain in the ligaments of the vertebral column. The line of gravity runs from a point anterior to the astragalus, upward just in front of the knee joint and between it and the common sacroiliac axis. It intersects the lumbosacral junction in front of the dorso-cervical junction, behind the cervical spine, terminating in the mastoid process.

The direct weight-bearing center is at the lumbosacral junction. Movement or pelvic tilts shift the burden ordinarily controlled by the angle of the superior surface of the first sacral vertebra, and when this angle becomes greatly exaggerated (lordosis) the strains are carried as high up as the third lumbar vertebra.

The normal sacral angle, according to v. Schubert,<sup>6</sup> who made an extensive study of this region, is in younger women  $90^{\circ}$  to  $110^{\circ}$ , in older women from  $130^{\circ}$  to  $140^{\circ}$ , and in pathologic conditions may be as great as  $160^{\circ}$ . In this condition of lordosis abnormal pressure is brought to bear on the intervertebral discs and the opposing surfaces of the vertebrae, to a lesser extent on the transverse processes. The constant strain and irritation brought about by this condition results in functional and anatomic changes which are prolific in the production of symptoms.

It is well to recall that muscle possesses two functions—postural tone and movement, the former controlled by the autonomic system, which should maintain correct posture without strain or fatigue. When it fails voluntary muscle contraction may be invoked to take its place, and this soon results in fatigue and pain.

On the other hand, gynecologic conditions are, of course, an important cause of loss of muscle tone. The periodic congestion incident to menstruation, the effects of pelvic degenerative and reparative processes and of the increased weight and distention due to gestation, stretch and thin the musculature of the pelvic floor, the abdominal walls and the lumbosacral region. The increased drag on the ligaments is transmitted to the osseous structures, with resulting derangement of the static dynamic mechanism, the production of lordosis with enteroptosis, easy fatigue, and pain.

Asthenia, frequently found in patients with gynecologic complaints, is a common cause of muscular inadequacy. The longer it persists the greater will be the strain on muscles, ligaments and joint cartilages. When this condition exists, and especially if it is associated with pregnancy and the postpartum period, every effort should be made to correct it.

Obesity, which is usually associated with muscular inadequacy, is a frequent cause of sacral pain at the time of the climacteric. It is a fairly common cause after childbirth, often being manifested as early as the latter part of the second or beginning of the third decade of life.

2. *Function and Pathology of Interarticular Cartilage.*—The cartilaginous intervertebral discs form cushions between the vertebrae and act as shock absorbers, and together with the intervertebral ligaments maintain elastic tension between the vertebrae. If they are subjected to abnormal pressure, they become flattened, with a resulting loss of elasticity, increased lordosis, and tilting of the pelvis.

The symptoms of this condition are defective posture, spinal rigidity and easy fatigue. They herald the onset of spondylitis with actual irritation of the spinal column.

A hitherto unsuspected cause of backache has been revealed by the studies of Schmorl and Junghans, and of Uebermuth.<sup>8</sup> They have shown that as a result of pressure and irritation the cartilage becomes notched and sclerosed, and clumsy lipping of the intervertebral discs occurs. At times the intervertebral cartilage may herniate into the softened vertebral body (Schmorl nodule). Projections of the cartilage may penetrate into the spinal canal and cause pressure on the cord. Schmorl and Junghans believe that the herniation is due to primary softening of the vertebrae caused simply by pressure.

It is well known that sacroiliac abnormalities constitute an important cause of backache. Due to the increasing weight in pregnancy there is a normal process of separation of both the sacroiliac and pubic symphyses, and with repeated pregnancies this condition may become more or less permanent. Roentgenologic examination in such cases shows a deep-seated lumbar lordosis with more or less symmetrical lowering of the sacrum and ossa innominata, with pronounced rotation of the sacrum around a transverse axis, widening of the sacral symphysis and relaxation of the attachments. In these cases considerable relief may be afforded by the application of a strong supporting belt.

3. *Skeletal Abnormalities and Diseases.*—Lesions of the skeletal structures which may give rise to symptoms can conveniently be classified as follows: (1) congenital and developmental abnormalities; (2) traumatic injuries; (3) pathologic processes.

*Congenital abnormalities* of the vertebral column are so exceedingly common that Schmorl and Junghans in a recent monograph state that the existence of a normal fifth lumbar vertebra has been questioned. They examined some 10,000 vertebrae in the effort to establish a normal standard for this structure. Brailsford<sup>9</sup> found congenital or developmental abnormalities in 26.4 per cent of the cases he examined, while Schroeder<sup>10</sup> of the Kiel Clinic places the incidence of these abnormalities at 69.8 per cent. Authorities agree that congenital defects may be present without causing symptoms. They should not be assumed to be the cause of the patient's complaint until all other possible lesions have been excluded.

Of the various types of congenital deformities Heuck<sup>11</sup> found spina bifida occulta to be the most frequent (30 per cent); next in frequency he found sacralization and lumbalization. These abnormalities are often unilateral, and then a triangular canal remains through which the nerve in its passage may be subjected to pressure and thus cause pain elsewhere in the field of its distribution. This may readily suggest a gynecologic cause for the pain.

The diagnosis of sacralization and lumbarization is readily made by the roentgenographic findings and the localization of pain when the patient stands or walks, or bends in different directions.

Other abnormalities found in the lumbosacral region are nonfusion of the laminae or of the spinous processes, and partial or complete absence of the neural arch of the first sacral vertebra.

*Spondylolisthesis*, more frequent than was formerly supposed, may be either congenital or of traumatic origin. Clinically it is characterized by shortening of the trunk, a decrease in the distance from the thorax to the symphysis pubis. The patient usually exhibits a peculiar waddling gait. The exaggerated lordosis gives rise to severe intractable pain, increased by standing and walking and relieved by lying down.

*Trauma*.—A history of injury is helpful in making the diagnosis where no other cause for backache can be discovered. Fracture of a vertebra is sometimes difficult to detect. Lateral and oblique, as well as anteroposterior, roentgenograms should be made. In unrecognized fractures patients may stand for a time without discomfort; but if they walk from half a mile to a mile, they become extremely uncomfortable and are obliged to sit down and rest.

*Spondylitis* as a cause of backache is of particular interest to gynecologists in connection with the work of Kienböck,<sup>12</sup> who has found a type of arthritis characterized by atrophy of the cartilage disc and diffuse porosis of the bone. He believes this process is dependent upon the calcium metabolism and is also related to the endocrine conditions incident to the menopause. To this type of arthritis he applied the term "arthropathia ovaripriva." Spondylitis may be due to a tuberculous process or to some focus of septic absorption. It may result from typhoid fever (typhoid spine), from yaws, dysentery, pneumonia, scarlet fever, and occasionally from gonorrhea.

*Constipation* may cause backache through the weight and drag of an overloaded colon. In this condition there is usually also an enteroptosis with its train of distressing symptoms.

Other conditions which must be borne in mind in determining the cause of lumbosacral pain are osteomalacia and rickets; more rarely osteitis fibrosa, Recklinghausen's disease, Paget's disease, and Kümmell's disease. Roentgenologic examination has at times revealed unsuspected tumor growths. It is also advisable to examine the urinary tract roentgenographically as it may harbor lesions which include backache in their symptomatology.

From this brief survey it is apparent that no other symptom known to medicine may result from such a diversity of etiologic agents as sacrolumbar pain. Again it must be reiterated that in determining the cause of pain in any individual case the whole static dynamic mechanism must be viewed as a functional unit. If any one point in the system fails the entire mechanism suffers, and pain may result at a

point far distant from the lesion causing it. Thus genu valgus, flat foot, and all deformities of the lower extremities exert an important influence on the weight-bearing mechanism.

In seeking the cause of lumbosacral pain the gynecologist, having given due attention to any pathology in his particular field, should consider the possibility that postural errors, anatomic defects, or some disease such as we have outlined may be operative in causing or aggravating the pain of which the patient complains. He should be thoroughly awake to the value of the roentgenologic examination, which usually determines where the difficulty lies. By following this policy many unnecessary gynecologic operations that fail to bring the expected relief from pain may be avoided.

This brings us back to our starting point, the relationship between gynecology and orthopedics. It is roentgenology which supplies the bond between these two branches of medicine and decides whether a particular case falls within the province of the gynecologist or that of the orthopedist.

#### SUMMARY

The rôle of gynecologic affections as a cause of lumbosacral pain has been considerably overestimated. Within recent years roentgenologic and pathologic studies of the vertebral column and pelvis have contributed greatly to our knowledge concerning the etiology of backache. It has been shown that incorrect posture, asthenia, obesity, and in fact any condition which causes undue stretching and thinning of the musculature of the abdominal walls, pelvic floor and spinal column, with dragging on the ligaments, will produce more or less lordosis and a shifting of the body weight to points not designed to support it, with resulting fatigue and pain. Skeletal abnormalities, arthritis, trauma, and various bone diseases are now recognized as important causes of lumbosacral pain. Endocrine and metabolic dysfunction are probably involved in the production of certain types of arthritis and other diseases of the osseous structures, such as rickets and osteomalacia. By keeping in mind the varied etiology of low back pain the gynecologist may at times avoid surgical attacks on the female generative organs that would inevitably fail to give the desired relief from pain.

#### REFERENCES

- (1) *Peiser*, quoted by Hans Albrecht: *Zentralbl. f. Gynäk.* 56: 2691, 1932.
- (2) *Opitz and Matthes*, quoted by Hans Albrecht: *Ibid.* (3) *Ward, G. G.*: *Bull. N. Y. Acad. Med.* 3: 238, 1927. (4) *Stein, Arthur*: *Am. J. Surg.* 3: 259, 1927. (5) *Kark, C. L.*: *Brit. M. J.* 1: 348, 1931. (6) *v. Schubert*, quoted by Hans Albrecht: *See Ref. No. 1.* (7) *Schmorl, G., and Junghanns, H.*: *Fortschr. die Roentgenstr., Leipzig, Thieme*, 1932 (*Monograph* 40:). (8) *Uebermuth, A.*: *Arch. f. klin. Chir.* 15: 567, 1929. (9) *Brailsford, J. F.*: *Brit. M. J.* 2: 827, 1932. (10) *Schroeder*: *Zentralbl. f. Gynäk.* 56: 2800, 1932. (11) *Heuck, W.*: *Virchow Arch. f. path. Anat.* 275: 278, 1930. (12) *Kienböck, R.*: *Arch. orthopäd. Chir.* 28: 609, 1930.



## DISCUSSION

DR. E. A. BULLARD.—While working in the Follow-Up Clinic of Woman's Hospital over ten years ago I first got the impression that many women were having pelvic operations for backaches which were not gynecologic. A study of the end-results of about 800 operative cases brought out strikingly these points that Dr. Stein has emphasized, namely, that though a woman may have the gynecologic pathology that is presumed to produce backache, you can perform an anatomically successful operation upon that woman and her backache may persist. About 85 per cent of those women who had successful correction of gynecologic conditions were, nevertheless, relieved of their backaches. Stimulated by that study I collected another series of nearly 200 women who had various types of pelvic pathology, each famous for producing backache, such as large fibroid tumors, fixed retroversions, procidentia, pelves crowded with tender inflammatory masses, none of whom had any backache.

The studies show clearly that we should never guarantee any woman that we will cure her backache by a gynecologic operation, because the etiology of pain in the back may be orthopedic, urologic, asthenic, neurologic, etc. I believe that we are much more cautious nowadays in promising relief of backache in the female.

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Allen, Edward, and Priest, Fred O.: *Physiological Responses of Ectopic Ovarian and Endometrial Tissue*, Surg. Gynec. Obst. 55: 553, 1932.

The anterior chamber of the eye has proved to be an ideal location for the study of growth and physiologic response of transplanted tissue.

The fact that endometrial tissue has peculiar properties of proliferation of its epithelium with invasion of adjacent structures forming typical gland-like spaces, has been further substantiated. Frequently this epithelium undergoes a metaplasia to a type resembling tubal epithelium. It has recently been suggested that tubal epithelium may undergo a transition and proliferation of its cells so as to be indistinguishable from normal endometrium.

Tubal epithelium is transplanted into the eye to see whether metamorphosis occurs into tissue of endometrial type.

Isolated segments of transplanted endometrium retain the property of alternate congestion and blanching which seem to be under the immediate control of ovarian activity.

The ease with which such a highly specialized tissue as that of the ovary can be made to live in this location is impressive.

In some instances, at least, the germinal epithelium suggests a power of proliferation. In others it suggests ability to initiate new follicular formation. This may be due to a compensatory hypertrophy following castration as indicated by the spontaneous appearance of follicles in transplants previously inactive. More definite evidence of this possibility is suggested by the regular appearance in implants of a sudden sensitivity to ordinary ovarian stimuli following castration.

One is forced to conclude that all ovarian tissue is not simultaneously responsive to known potent stimuli. This may be due to the fact that a portion is in a resistant phase or because new ovules are in the process of formation and growth. These physiologic functions are under control of blood-borne stimuli and are independent of location and nerve supply. Some of these phenomena cannot be explained, but future observations may lead to their solution.

WM. C. HENSKE.

## THE IMPORTANCE OF ESTABLISHING A CONDITIONED REFLEX "PREGNANCY—SYPHILIS" IN THE MINDS OF THE MEDICAL PROFESSION\*

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**S**URPRISINGLY great is the variety in the reported statistics concerning the prevalence of syphilis in different countries and under different social conditions. Pregnant women show prodigious variation in this regard. For example, Dr. Goldberg, of the New York Tuberculosis and Health Association, has collected figures from a wide variety of sources in this country. The highest incidence is reported from Birmingham, Ala., where among 629 colored women 24.8 per cent were infected, approximately 1 in 4. In the same community only 8.7 per cent among 116 white women were infected, approximately 1 in 12. These are health department statistics and probably are weighted with a number of indigent and casual individuals. The Chicago Lying-In Hospital where the patients are mostly white has 2.6 per cent incidence of positive Wassermanns among 6,954 obstetric patients, while the Sloane Hospital here reports 3.6 per cent positive Wassermanns among 9,955 women. These again are mostly white. In comparison with these figures it would be interesting to quote the percentage of positive Wassermanns on pregnant women found in the different hospitals of greater New York. Let me select a few. Harlem Hospital, with a great preponderance of negroes, shows 15 per cent positive Wassermanns during the past five years. Lying-In Hospital shows 2.5 per cent of whites and 12 per cent of negroes. The other hospitals not separating the negroes from the whites, vary to an extraordinary degree. The Berwind Maternity Clinic reports 12 per cent positives on 367 pregnant women; the Long Island College Hospital, 6 per cent on 1,200; the Coney Island Hospital, 5 per cent on 4,746; the Nursery and Child's, 3 per cent on 1,119. In contrast, hospitals with a preponderance of private patients show extremely low incidence of positive Wassermanns. Thus the United Israel Zion Hospital of Brooklyn reports 0.3 per cent on 1,477 obstetric patients. The Jamaica Hospital reports 0.2 per cent on 635.

Anyone with medical experience realizes that the spirochete is no respecter of persons. The rich become syphilitic as well as the poor but they are, on the whole, better treated and more likely to reach the obstetric clinic at a time when the Wassermann is negative. This has encouraged many hospitals of this city to omit Wassermanns or cor-

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responding serologic tests for private patients. The obstetrician who brings in a private patient is permitted to elect whether that patient shall be tested for syphilis or not.

Now I am not an obstetrician; I am not a gynecologist; I am not a syphilologist. My interest in the prevention of venereal diseases is my excuse for appearing here tonight, representing the Social Hygiene Committee of the New York Tuberculosis and Health Association. What I hope to impress upon you is the importance of establishing a conditioned reflex, pregnancy—syphilis, in the minds of the medical profession.

Three things are perfectly well known to me and doubtless to all of you. Syphilis, unlike gonorrhea, can almost always be so treated during the course of pregnancy that the child will not be infected. The figures of Laurent are well known: 563 untreated syphilitic pregnancies left only 26.5 per cent of infants alive at the age of three months, while the same women subsequently treated for syphilis during 161 pregnancies had 91.9 per cent youngsters alive at three months. McCord at his famous Atlanta clinic chiefly among negroes reduced the stillbirths from 70 per cent to 5 per cent and increased the babies born alive from 30 per cent to 93 per cent. There is no need to multiply statistics further.

Further, syphilis, like gonorrhea, is extremely difficult to diagnose during the course of a pregnancy. Indeed we may stress the point and say that to judge from animal experiments as well as from the phenomena of human disease, pregnancy inhibits the symptoms and lesions of syphilis.

Most of you have not lived long enough to remember that at the beginning of this century there were three kinds of congenital syphilis: paternal syphilis, maternal syphilis, and syphilis inherited from both parents. Before the Wassermann reaction came along to wipe out this beautiful theory, one of the most distinguished German syphilologists had written a book crammed full of cases illustrating the successful treatment of hereditary syphilis of paternal origin by antisiphilitic treatment of the father. Fournier had developed the beautiful theory of *choc en retour* to explain how tertiary lesions occurred after pregnancy in 60 per cent to 80 per cent of the nonsyphilitic mothers who had borne syphilitic children to syphilitic fathers. This pretty theory was that these tertiary lesions were not due to the living infectious virus of syphilis (*treponema* being as yet undiscovered) but were due to a toxin absorbed during the nine months of pregnancy by the mother from her syphilitic child, herself thus immunized to the disease.

Reason staggered along under the weight of this theory until Wassermann and Ehrlich broke it up.

Now the excuse for venturing to summarize for you this quaint bit of medical history is because it is perhaps due to some residue of the habit resulting therefrom, that we today treat the possibility of syphilis

in pregnancy with more levity than we do that of gonorrhea. To return to the proper title of this paper we must realize the importance of establishing a conditioned reflex "Pregnancy—Syphilis" in the minds of the medical profession. Such reflex has been established as to "Pregnancy—Gonorrhea." No physician could omit to drop silver nitrate solution in the eyes of the newborn child. Yet any one of you who takes care of children is aware of lives mutilated or destroyed because a similar hard and fast rule has not been established in the minds of the medical profession with regard to syphilis. The poor are taken care of, for the routine of the clinic requires a serologic diagnosis of syphilis. The rich are not so fortunate. Let me add another phrase to your medical catchwords, "Because a woman can afford to pay for the treatment of a syphilitic child is no reason why she should be permitted to have one."

Do not offer as an excuse your hesitation to mention syphilis to an uninformed woman. There is no need to mention it. A specimen of blood may be obtained on any one of a number of other assumptions.

In conclusion let me ask you, do you take this seriously? Do you think that a physician should be required to perform a serologic test for syphilis the moment a pregnant woman applies to him? I do, for, let me repeat,

Syphilis, like gonorrhea, is no respecter of classes. To fix that in your mind let me repeat the cynical aphorism of a French urologist, "No woman, however beautiful, can give what she has not got."

Syphilis may, like gonorrhea, be difficult of diagnosis at any time during its chronic course, but pregnancy renders syphilis particularly obscure by inhibiting its somatic lesions, leaving only the blood reactions of the disease as a means of diagnosis.

Syphilis, unlike gonorrhea, can be controlled during pregnancy by treatment.

## REVIEW OF 205 CASES OF OCCIPITOPOSTERIOR POSITION

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A VOLUMINOUS amount of literature has appeared in the past few years regarding the proper treatment of occipitoposterior positions and the complications incident to the proper handling of these cases. Comparing the authorities, we can readily see how confusing the literature is regarding the treatment of occipitoposterior cases. Two main views are held; one advises operative interference as soon as the cervix has dilated, the other holds the opinion that the majority of cases will rotate spontaneously, although the length of labor is prolonged. Believing this subject to be of sufficient importance, we have undertaken a review of 1128 obstetric cases. I am indebted to Dr. Clarence B. Ingraham, of Denver, for the study of these cases obtained from records in private practice. While occipitoposterior presentations were treated with serious consideration, no operative interference was instituted except for very definite reasons. The usual indications, such as emphasized by Williams, were considered as a standard.

In these 1128 cases, the occipitoposterior position occurred in 205 cases, or 1.82 per cent. No doubt many cases were seen after rotation from the occipitoposterior to the anterior had occurred. The left occipitoposterior variety occurred 16 times, or a percentage of 7.8, a ratio of 1 to 13. This is somewhat less than many authorities report. Vaux finds the left occipitoposterior position in 118 out of 212 cases.

Rotation from the occiput posterior to the occiput anterior occurred in 129 cases or 62.93 per cent. Of these cases in which rotation occurred spontaneously, forceps were used to complete the delivery 26 times, and of these 21 were low forceps and 5 were midforceps.

Delivery with the occiput in the directly posterior position is generally acknowledged to lengthen labor and predisposes to a greater incidence of maternal lacerations. West and Varnier find that rotation to the hollow of the sacrum occurs in 2 to 3 per cent of the cases. Delivery in the occipitoposterior position in this series occurred in 28 cases, 15 of which, or 7.3 per cent of the 205 cases rotated to the sacrum spontaneously and the patients were delivered without operative interference. Six cases rotated to the occiput posterior spontaneously and required operative delivery, and 7 were rotated and delivered by forceps. In other words, 53.6 per cent of the cases that rotated to the hollow of the sacrum delivered spontaneously. At times, after application of forceps in the occipitoposterior position, rotation to the anterior variety was obviously attended with considerable danger to the baby. We believe that the stress and force required to effect

rotation very often is the direct cause of serious fetal injury, and in such cases delivery in the persistent posterior position is a more rational procedure.

Podalic version and extraction were performed 3 times. Rotation from the occipitoposterior to the "deep transverse arrest" was noted in 8 cases. Low forceps were used in 6 of these cases and mid in 2. Two Scanzoni maneuvers were performed, and rotation to the anterior position accomplished before traction was employed. Manual rotation from right or left occipitoposterior position to the anterior was performed in 11 cases; of these, 9 delivered spontaneously, and in 2 cases delivery was effected by forceps. The Voorhees bag was employed once, for a placenta previa. Episiotomy was performed in 71 of the 205 cases. No cesarean section was done because of an occipitoposterior position.

Occipitoposterior presentations cause the length of labor to be increased. It will be of interest to compare the length of labor in these 205 cases:

TABLE I. LENGTH OF LABOR

Spontaneous rotation to O.A. and delivery	11 hr., 27 min.
Spontaneous rotation to O.A.; instrumental delivery	19 hr., 36 min.
Manual rotation to O.A.; spontaneous delivery	19 hr., 11 min.
Manual rotation to O.A.; instrumental delivery	26 hr., 32 min.
Spontaneous rotation to O.T.; instrumental delivery	20 hr., 13 min.
Scanzoni Maneuver	43 hr., 18 min.
Spontaneous rotation to O.P.; instrumental delivery	25 hr., 27 min.
Spontaneous rotation to O.P. and delivery	8 hr., 25 min.
Instrumental rotation to O.P.; instrumental delivery	20 hr., 28 min.

The comparison between the course of labor in the primiparous and multiparous woman is given in Table II:

TABLE II

	PRIMIPARA	MULTIPARA
Hours of labor	17 hr., 36 min.	9 hr., 30 min.
Forceps delivery	55 cases, 26.83 per cent	2 cases, 0.98 per cent
Version and extraction	9 hr., 40 min.	2 hr., 59 min.
Average weight of baby	6 lbs., 8 oz.	7 lbs., 3 oz.
Operative interference, all types	59 cases, 28.78 per cent	3 cases, 1.46 per cent

The influence of pre- and postmaturity was investigated. Fourteen days within either side of the estimated date of confinement was considered to be a normal limit. This is shown in Table III:

TABLE III

20 CASES	PREMATURE	POSTMATURE
Average maturity	31 days	21 days
Average weight	5 lbs., 7 oz.	8 lbs., 2 oz.
Length of labor	14 hr., 55 min.	12 hr., 57 min.
Operative interference	5 cases	2 cases
No interference	8 cases	5 cases

There were no maternal deaths in this series. The fetal mortality was 8 out of 205 cases, or 3.9 per cent. Three versions and extractions were performed, with a death of 2. None of these was elective in type. A review of the fetal deaths is given briefly:

1. Primipara, pelvic measurements normal. Long, hard labor, forceps applied after twelve hours of ineffectual, strong pains. Delivered in persistent posterior position, 2 coils of cord very tight about neck. Baby gasped only once.

2. Version and extraction, dry labor, membranes ruptured two hours after onset of pains. No dilatation after fourteen hours of hard pains, Voorhees bag inserted. Podalic version and extraction, very difficult to perform, due to contraction of uterus. Cord became prolapsed early in start of version and extraction and pulsation was very feeble. Stillborn, heart action for ten minutes.

3. Normal R.O.P., primipara, easy labor. No operative interference, born in persistent posterior position. Heart tones not heard during end of second stage, and considerable meconium present. Baby born dead.

4. Edema of placenta. Short labor, baby born in persistent posterior position, lived ten minutes, gasped once. Placenta large, weight 1,126 gm.

5. Primipara, normal measurements, membranes ruptured three and one-half hours before onset of labor. Labor then induced with castor oil and quinine, pains hard but not effectual. Patient exhausted. Cervix dilated manually, impossible to attempt version, as uterus contracted hard about baby. Forceps applied in O.P. on floating head. Baby dead, probable cerebral injury, no autopsy.

6. Version and extraction, membranes ruptured with first pain, arm prolapsed to elbow one and one-half hours after onset of labor, no pulsation of cord at beginning of version and extraction. Baby breathed several times. No notification of labor was made in this case until the prolapsed arm was recognized by the patient.

7. Primipara, normal measurements, nephritic toxemia, casts, albumin, and blood pressure elevated. Manual dilatation of cervix, membranes ruptured and mid-forceps applied. Delivered in persistent posterior position, as it was impossible to rotate head. Child died in three days; cerebral hemorrhage.

8. Multipara, head did not engage until second stage, labor long. Pallid asphyxia, with marked overlapping of skull bones. Patient given pituitrin towards the end of second stage. The pituitrin used was prior to the present standardization, and resulted in excessive reaction with rapid descent of the head.

A review of these cases shows us that occipitoposterior positions may be considered with a certain equanimity of mind, but must be most carefully observed and interference instituted when necessary. Operative interference occurred in 30 per cent of these cases. The fetal mortality was 3.9 per cent, and excluding Cases 3, 4, and 6, we have a corrected mortality of 2.44 per cent. This compares very favorably with other statistics, for instance, Vaux, in 212 cases, reports 8 infant deaths and 5 stillbirths; Bill, in a review of 500 cases which he personally delivered, reports a fetal mortality of 2 per cent for all babies, and excluding such cases as congenital deformity of heart, enlarged thymus, etc., the corrected fetal mortality was 1 per cent. The fetal mortality of the Cleveland Maternity Hospital, in which the general policy and methods of Bill were practiced, was 4.47 per cent, with a

corrected mortality of 3.1 per cent. Ingraham, reporting a series of 100 cases from the Johns Hopkins Hospital, found a fetal mortality of 5 per cent with a corrected mortality of 3 per cent.

For the physician who has had only the average training in obstetrics, and who practices the latter along with other specialties in medicine, we believe that the better treatment of these posterior positions is the conservative, knowing that from 70 to 80 per cent will rotate spontaneously. Then, when indicated, interference may be resorted to according to the exigencies of the individual case. For the physician who has had considerable training and experience, we still believe the conservative treatment to be that of choice.

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## THYROTOXICOSIS IN ITS RELATION TO PREGNANCY

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IN ANY study of hyperthyroidism or thyrotoxicosis as a complication of pregnancy, one is at once struck by the extreme rarity of the condition. In considering pregnancy as an accompaniment of hyperthyroidism, Lahey in a series of 3,678 patients operated on for toxic goiter, found 15 who were pregnant, an incidence of 0.41 per cent. Mussey, obstetrician at The Mayo Clinic, reports 42 cases of coexisting pregnancy in 7,228 cases of hyperthyroidism in women, an incidence of 0.6 per cent. On the other hand, in considering thyrotoxicosis as a complication of pregnancy, the viewpoint in which we as obstetricians are primarily interested, Yoakam of Detroit, in the heart of the so-called goiter belt, reports an incidence of 3.7 per cent in a large series of pregnant women, while Markoe was able to find only 8 cases of real hyperthyroidism in 100,000 pregnancies at the New York Lying-In Hospital.

In reviewing the literature, one is likewise impressed with the dearth of articles bearing on this subject. Falls of the Obstetric Department of the University of Illinois has explained this paucity of literature by stating that no one man has had a wide experience in this type of obstetric complication. In the literature of the past ten years, every writer of importance has almost without exception commented upon the rarity of coexisting pregnancy and thyrotoxicosis. There are listed in the *Index Medicus* for the ten-year period 1921 to 1931, sixteen articles in all languages dealing with or bearing upon the subject. Some of these are nothing more than case reports.

The experience of The Brooklyn Hospital has been in close accord with that recorded by others. From 1921 to 1931 there were admitted



to the obstetric service there, approximately 11,571 women. I have been able by careful search through files and cross files to find nine cases of pregnancy complicated by thyrotoxicosis. We have had in addition to these 9 cases, 3 cases in whom subtotal thyroidectomies had previously been done and were followed by pregnancy and 4 cases delivered there in whom thyrotoxicosis requiring operation is known to have subsequently arisen. There was no evidence to show that pregnancy was in any way responsible for exciting the thyrotoxicosis that made operation necessary later and in those where pregnancy occurred following the thyroid operations, no recurrence of symptoms was caused by it. Most authorities advise against pregnancy for at least two years following thyroidectomy, though many instances have been cited where pregnancy occurred very soon afterward with no ill effects.

Of the 9 cases of thyrotoxicosis in this series, in two the symptoms were of such mild character as to cast grave doubt on their being real cases of thyrotoxicosis. In neither were any of the cardinal clinical findings of exophthalmus, lid-lag, tachycardia, tremor or thyroid enlargement recorded in the physical examination. Neither had basal metabolic estimations while in the hospital. In neither was the labor or delivery complicated in any way. In one the puerperium was uncomplicated, in the other a postpartum pyuria with fever and chills failed to bring out any evidences of thyrotoxicosis. It seems doubtful that these two cases should really be included in the series.

A third case having slight thyroid enlargement with slight tremor and no other symptoms was in for study at the fourth month of gestation. Basal metabolism was +10 and it was decided that her symptoms were so mild that her pregnancy might be carried to term without danger. She was not delivered at the Brooklyn Hospital, but I am told that her pregnancy, labor, and delivery were entirely normal.

There were two cases in which thyrotoxicosis was suspected prepartum and postpartum reactions were attributed to this condition. In the first there was slight enlargement of the isthmus of the thyroid, slight exophthalmus and tachycardia. No basal metabolic estimations were made either before or during hospitalization. Sudden increase in pulse rate to 130 and 120 the first and eleventh days postpartum were thought due to hyperthyroidism. In the second case, a moderate enlargement of the thyroid was noted on admission to the prenatal clinic. She was at once referred to the medical clinic where the opinion was expressed that no thyrotoxicosis existed. A basal metabolic rate of +17 was regarded as unreliable because the patient ate before the test. Nothing more arose in her prenatal course to suggest overactivity of the thyroid. Labor was rather slow and nagging and of nineteen hours' duration. Delivery was by forceps control. Her pulse was rapid at times during labor and delivery, ranging from 96 to 160. Bleeding during and following delivery was normal. Two hours after delivery she suddenly went into collapse, respiration became rapid and shallow with expectoration of blood tinged sputum, cyanosis appeared and the pulse rose to 200. Medical consultation noted cardiac dilatation and basal râles of heart failure and suggested thyroid crisis as the cause. Recovery was gradual over a period of several hours with the use of morphine and digifoline. In reviewing this case in the light of 3 cases of sudden intrapartum and postpartum collapse due to aspiration during or following inhalation anesthesia and exhibiting very similar symptoms, seen and studied by the obstetric service during the past year,

and in view of the very early appearance of symptoms, absence of high temperature and recovery without the use of iodine or thyroxin, those of the obstetric department who were in charge at the time have wondered if this might not have been such a condition rather than a thyroid crisis.

Three patients of the nine were aborted in the early weeks of their pregnancies because of symptoms of thyrotoxicosis. In the first, a girl of twenty-three had had babies three years and nine months previous to this interruption. With the first she had a twelve hour labor during which a manual rotation from R.O.P. to L.O.A. was done, with the second a twelve hour labor with Scanzoni rotation from R.O.P. to R.O.A. In neither did she manifest any evidences of thyrotoxicosis. On physical examination she manifested a unilateral exophthalmus without other eye signs, slight tremor, moderate elevation of pulse rate, and a slight degree of thyroid enlargement. A metabolism test was done, but through some error not recorded. Interruption of the pregnancy was accomplished by dilatation and curettage under gas-oxygen and ether anesthesia without exacerbation of the symptoms of thyrotoxicosis. This patient came under my observation as a private patient a month after the birth of her third baby and was seen through the vicissitudes of acute mastitis, influenza, an induced abortion, and an acute bilateral salpingo-oophoritis over a period of three years. There was during this time no recurrence of her thyrotoxicosis. The second patient aborted was a thirty-four-year-old multipara who had had a difficult delivery at home with her first baby nine years previously. No evidence of thyrotoxicosis was noted on her previous admission. On admission for interruption she was complaining of nervousness, palpitation, dyspnea, and enlargement of the thyroid gland. She exhibited a slight exophthalmus and smooth symmetrical enlargement of the thyroid without lid-lag or tremor. Her metabolic rate was +23, pulse 80 to 100, blood pressure 110/70. In speaking of metabolic estimations, it may be well at this point to call attention to the more widely accepted views on the normal metabolic rate during pregnancy. Sandiford and Wheeler have shown that the rate remains normal up to the last three months. During this last trimester it rises 25 to 30 per cent. They have shown likewise that this increase is not due to increased thyroid secretion, but rather to the increase in protoplasmic mass. A diagnosis of hyperthyroidism complicated by early pregnancy was concurred in by a medical consultant and the patient aborted in the seventh week of her pregnancy by dilatation and curettage under gas-oxygen and ether anesthesia. She made an uneventful recovery without aggravation of her thyroid symptoms. The third case aborted was a multipara, aged thirty-nine, who had had a thyroid operation, probably ligation, twenty years previously. For the past two or three years she had been getting progressively more nervous. Physical examination revealed slight exophthalmus without lid-lag or tremor and an adenomatous thyroid. Her basal metabolic rate was +24. It was the opinion of the medical consultant that at her age the pregnancy might activate her adenomatous thyroid in a dangerous degree. Her pregnancy was interrupted at two months by dilatation of the cervix and removal of the products of conception. Her postoperative course was uneventful.

The last case in this series was one of adenoma in which there is some reason for believing that rapidly repeated pregnancies were instrumental in stirring the thyroid into overactivity. She had five full-term pregnancies and one miscarriage in a period of six years. She was admitted to the medical clinic complaining of enlargement of the thyroid, first noted during a pregnancy four years previously, nervousness, palpitation, excessive sweating of the hands and tremor since that time. There was no lid-lag or exophthalmus, but there were present a fine tremor of the fingers, flushing of the skin, a quick Tache and moist palms. The thyroid enlargement was due to a nodule in the right lobe. Basal metabolism was +19.

She was six weeks pregnant and was referred to the prenatal clinic. She was followed closely in the medical, surgical, and obstetric clinics. The tumor in the thyroid grew somewhat larger. Her nervous symptoms and palpitation were ameliorated by  $\frac{1}{2}$  grain doses of luminal given twice daily. Lugol's solution, 5 minims, was given once a week. A metabolism test done in the sixth month of her gestation was +21. No increase in toxic symptoms was noted during the remainder of her pregnancy. She went into labor as the result of the administration of castor oil and quinine when at term and had a rapid labor with spontaneous delivery. Her postpartum course was entirely normal. It is of interest to note that this baby had a cleft palate and harelip. Her fifth baby was a so-called blue baby and died in five days from hemorrhages. Williamson of Pittsburgh reports fetal anomalies in mothers suffering from thyrotoxicosis in a considerable number of instances. He reported 7 cases of melena neonatorum, 1 congenital heart, and 4 anencephalics in 48 such cases. Most other authorities, however, have failed to note such anomalies and have expressed opinions that they are no more common here than elsewhere.

It is obvious that no conclusions can be drawn from so small a group of cases as this. I shall therefore close by giving a résumé of the conclusions arrived at by workers in some of the larger thyroid clinics, comparing or contrasting where possible with the work done in this hospital. The articles referred to most frequently and consistently in the literature of the past ten years have been those of Mussey, Plummer and Boothby of The Mayo Clinic, Lahey of Boston, Yoakam and Plass of Detroit and Iowa, Falls of the University of Illinois, and J. W. Hinton of New York. In foreign countries, Fahrni of Canada, Gardiner-Hill of England and Seitz of Germany have been the larger contributors.

All are agreed that simple colloid goiter presents no problem other than the administration of iodine or thyroid extract as a prophylactic measure in the prevention of congenital goiter. In the simple enlargement of the thyroid so frequently seen accompanying pregnancy and without toxic symptoms, most authorities have advised the use of iodine throughout pregnancy. In this country iodine is preferred by most, while in Europe, thyroid extract would seem to be the more favored.

From the literature available at this time the cases of thyrotoxicosis from adenomatous goiter during pregnancy would seem to be considerably fewer than those from exophthalmic goiter. The explanation is a twofold one; first, only about one-third of all cases of thyrotoxicosis are adenomatous in origin; second, adenomatous thyrotoxicosis is in a large percentage of cases a condition that arises at an age when a woman's reproductive powers are waning and pregnancy consequently occurs less frequently. In dealing with either toxic or nontoxic adenoma in pregnancy, all are in thorough accord that iodine or thyroid extract should never be used at any time or in any dose except as a preparatory preoperative measure because of the danger of increasing a thyrotoxicosis already present or creating one in a dormant gland. There is,

nevertheless, an occasional case reported in which iodine has been used in adenoma without its activation and at least one in which it was of benefit. In the series reported here, there is one such case. In toxic adenoma, the danger seems to be less from the toxemia itself than from the strain pregnancy, labor, and delivery imposes upon organs already damaged by a long continued thyroid toxemia. A hard labor and difficult delivery have more than once been the last straw that broke the back of a heart weakened by a long continued thyroid toxemia. On the other hand, several writers have expressed the opinion that the burden of several pregnancies following in rapid succession in patients with quiescent adenoma has been responsible for the activation of these adenomas. The last case in our series would seem possibly to substantiate this theory.

In true exophthalmic goiter or Graves' disease, pregnancy is a very unusual complication, as a very large majority of those women suffering from this disease are rendered sterile by it, and when pregnancy does occur, conception has usually taken place during a remission. Gardiner-Hill of England and Seitz of Germany report a much higher incidence of pregnancy than do any of the American writers. Their figures, however, were compiled before the present-day wide use of iodine in the treatment of thyroid conditions. A second pregnancy in a persistent Graves' disease is still more unusual. In an occasional case, the onset of hyperthyroidism occurs during pregnancy, and in these the symptoms are often rapid and fulminating. It is often only with extreme difficulty that the symptoms of mild thyrotoxicosis are differentiated from those of the nervous state that frequently accompanies the early months of pregnancy. It is emphasized by nearly all writers that hyperemesis gravidum may sometimes be that of a beginning thyrotoxicosis rather than one due to the pregnancy, and that all such cases should be investigated from that standpoint. It is said that hyperemesis due to thyrotoxicosis responds to Lugol's solution in truly dramatic fashion.

When the symptoms of thyrotoxicosis in pregnancy are definitely established, the procedure to be followed depends upon several factors. The two factors of major importance are, of course, the severity of the thyroid intoxication, and secondly the period of gestation. Pregnancy may influence thyrotoxicosis in one of three ways: one, in a fair percentage of instances the thyrotoxicosis is definitely improved. In an occasional case this improvement is permanent. Two, the pregnancy may neither ameliorate nor aggravate the thyrotoxicosis. Three, the pregnancy may definitely and markedly increase the thyrotoxicosis. Mussey states that in his series of cases he found no evidence that pregnancy influenced the course of exophthalmic goiter in any way. Complications due to long standing chronic thyroid toxemia must always be given the most careful consideration. The effect of pregnancy on

any given case of thyrotoxicosis may, therefore, be determined only by a careful and prolonged study of the case in question.

Where the symptoms are mild and do not progress, no treatment at all is necessary, or iodine may be used throughout the pregnancy. There were two such cases in our group. Neither had iodine. It seems to be the consensus of opinion that all patients manifesting symptoms of hyperthyroidism, except those with adenoma, may safely be given iodine during gestation without fear of making these symptoms worse, and often may be the means of enabling such a patient to get through her pregnancy without thyroid operation. If the disease is to progress, it will do so in spite of and not because of the iodine therapy. Hinton and Lahey, both surgeons, are the dissenters on this point in saying that iodine should never be used except as a preparation for operation.

All authors referred to in this paper with the exception of Hinton agree that from a strictly medical standpoint, abortion is practically never indicated. If the symptoms are relatively mild they will probably remain so; if they are becoming definitely worse, the dangers of inciting thyroid crisis by abortion or a possible subsequent infection far outweigh the benefits of abortion, as real thyrotoxicosis seldom subsides, but must be dealt with *per se* sooner or later regardless of the abortion. We had three cases in which early abortion was done. In at least one, the subsequent course would seem from a strictly medical standpoint to indicate that abortion was unnecessary.

In each series of cases presented by the various workers quoted in this paper, thyroid operations, usually subtotal thyroidectomies, were performed in the majority of their really advanced toxic cases. The older method of preliminary ligation of the superior thyroid arteries has been almost entirely replaced by the use of iodine preoperatively, though before the use of iodine, it alone without further surgery was often responsible for sufficient subsidence of the thyrotoxicosis for successful termination of the pregnancy. The presence of pregnancy did not in itself increase the operative mortality or complications in those cases subjected to operation. The operation of subtotal thyroidectomy was as effective in relieving the symptoms of thyrotoxicosis in the pregnant as is the operation in the nonpregnant. These results were as permanent as might have been expected in the nonpregnant. The incidence of abortion, miscarriage, and premature labor following operation on the thyroid was almost nil and was far less than might have been expected had the cases been allowed to continue in progression without operative interference. There were no cases in our series where a thyroid operation of any kind was performed during pregnancy.

The procedure of choice then would seem to be an adequate regimen of rest and sedation, iodine therapy in thyrotoxicosis from exophthalmic goiter and most careful observation and study by all clinical and laboratory methods at our command throughout the period of gestation. Doubly

cautious observation during labor and a type of delivery designed to shorten the second stage as much as is commensurate with safety. In an occasional case, particularly in premature labors caused by the thyrotoxicosis itself, it has been found expedient by some workers to deliver by vaginal or abdominal cesarean section. If the thyrotoxicosis continues to progress in spite of these measures and reaches a degree demanding some form of interference, occasionally ligation or more frequently subtotal thyroidectomy should be resorted to rather than abortion or induction of labor prematurely before viability of the child. In an occasional case where the symptoms of thyrotoxicosis have increased with great rapidity and suddenness near term, induction of labor may seem wise to avoid the possible strain of labor and delivery before equilibrium has been reestablished after thyroid operation.

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**Francillon-Lobre and Dalsace: Tubal Insufflation and Hysterio-salpingography.**  
Bull. de la Soc. d'Obst. et de Gynéc. 2: 91, 1932.

Gynecologists are divided into two groups, the one employs the Rubin insufflation test exclusively to determine tubal patency, and the other hysterosalpingography. The authors report a series of 450 cases of sterility among which 74 tubal insufflation tests were performed. In 27 cases only insufflation was performed and 5 of these patients (18.6 per cent) became pregnant. It was strange that in three of the 5 cases of pregnancy the insufflation test revealed closed tubes.

In 31 cases insufflation was followed by the injection of lipiodol. The latter was done only when the insufflation test was negative or no pregnancy followed the Rubin test for six months. In 26 cases the result of hysterosalpingography was identical with the insufflation test but in 5 cases the tubes were permeable to lipiodol but had been impermeable at the time of insufflation. Among the 31 cases there were 6 pregnancies (19.3 per cent) after the injection of lipiodol. In 8 instances the authors first injected lipiodol and later performed a tubal insufflation test and in all the cases the latter test corroborated the former. No pregnancy occurred although the tubes were patent in 4 cases.

This study reveals that the injection of lipiodol resulted in a pregnancy 9 times (23 per cent) where insufflation failed but in not a single instance did gestation follow an insufflation test which was made after a negative lipiodol test. This cannot be explained on a mechanical basis. The authors maintain that insufflation and hysterosalpingography each have their indications and the latter may yield results when insufflation has failed.

J. P. GREENHILL.

## ELEPHANTIASIS OF THE VULVA

WITH AN ANALYSIS OF TWENTY-SIX CASES IN NEGRO WOMEN, FROM THE  
RECORDS OF CHARITY HOSPITAL IN NEW ORLEANS

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GENITAL elephantiasis is characterized by the same pathologic changes and exhibits the same general etiology as other types of elephantiasis, but it is unique, in the opinion of many observers, in the part which syphilis plays in its production. Many years ago Bandler pointed out that the tertiary manifestations of syphilis, which are so frequently seen in old prostitutes in the form of diffuse syphilomas, are really elephantiasic conditions, and his demonstration of spirochetes in the tissues and in the venous and lymphatic structures makes his theory quite tenable. McDough, Hill, Mracek, Frances, and Adamson have cited similar cases, in many of which the transition from the original syphilitic lesion to true elephantiasis was even more conclusive. But in syphilis also the infectious factor is necessary for the transition. Saboraud may be correct in his opinion that an abrasion is not necessary for its entrance, but infection of some sort is prerequisite, and the portal of entry is quite clear in such a group of cases as that reported by Frances, for instance, all of which exhibited more or less extensive ulceration.

The tendency of syphilitic processes to cause lymphedema, the so-called edema induratum, edema indurativum or edema sclereum, which follows initial lesions, is observed in everyday practice and needs no further proof. It results, according to Lang, from a condition of increased tension in the affected parts, it is a constant accompaniment of the initial lesions of syphilis, and it is nearly always found in the genital areas. It complicates the lesions of constitutional syphilis, and it reappears with the tertiary manifestations of the disease. In the early stages, when the proper local and general treatment is undertaken, this edema slowly but steadily subsides, leaving no residue. In the late period, in both men and women, it tends to be persistent, and the hypertrophy may progress until it has reached monstrous proportions. The edematous process is the result primarily of the occlusion of the lymphatic channels from coagulation of the lymph substance, which is caused by the biologic activities of the spirochetes, or it may arise from the original syphilitic focus, as the result of a specific inflammatory process of the lymph vessels.

In the cases reported by Ravogli the elephantiasis was always the result of an extended ulcerative process originating in tertiary syphilis and occasionally associated with local tuberculosis, which itself tends to cause a further destruction. Any type of bacteria, it would seem, might be responsible for the infection, and Heidingsfeld, discussing Ravogli's contribution, quotes a particularly interesting case of his own to prove the possibility of the gonococcus as the offending organism. According to Ravogli, the steps of the pathologic change are always the same: when extensive chronic genital ulcers of the phagedenic type are present, as the result of a diffuse gummatous infiltration, the ulcerative process is an open door to the entrance of any type of infection, and the chronic hypertrophic lymphangitis which results eventually terminates in true elephantiasis of the vulva.

#### ANALYSIS OF CASES

The tendency of even experienced clinicians to diagnose as elephantiasis any type of genital hypertrophy or edema is evident in the fact that although 41 cases are filed in the records of Charity Hospital in New Orleans from 1911 through 1931 under the caption of elephantiasis of the vulva, 15 had to be eliminated from this study: neither clinically nor microscopically did the description of the disease meet the cardinal requirements for a diagnosis, the presence of a fibromatosis or hypertrophy of the underlying connective tissue. A single illustration of the error will suffice. A female colored patient in her twenties entered the hospital exhibiting a marked edema and enlargement of the vulvar structures, in addition to a general glandular enlargement, a febrile reaction and a skin rash of the maculopapular type. Her chief complaint was the discomfort of the vulvar hypertrophy. The Wassermann test was plus 4, intensive specific treatment was begun, and within ten days a complete symptomatic and anatomic cure had been achieved, the prompt response to antisyphilitic treatment proving that the condition was purely syphilitic.

Eliminating these 15 cases, then, we have remaining 26 cases which can be accepted for purposes of study, and which, curiously enough, all occurred in the colored race, as did, for that matter, 14 of the 15 cases discarded. The disease is very uncommon in white women, but Hill and others have called attention to its relatively high incidence in negroes, which is probably to be explained by the frequency of venereal infection in this race. The very small hospital incidence of vulvar elephantiasis, an infinitesimal fraction of 1 per cent, should be noted. The hospital population during the two decades covered by this study approximated 400,000, almost equally divided between white and colored, and represents so true a cross-section of the general population that the small incidence of the disease may fairly be accepted as actual and not accidental.



Since colored women are notoriously prone to ignore disease until it causes intolerable discomfort or acute pain, it is not surprising to find that in many instances the hypertrophy had attained a considerable size and had lasted a considerable time before relief was sought. In one instance the condition had been noted for more than ten years, and the average duration of symptoms was twenty-five months, though it must be pointed out again that it is extremely likely in every instance that the changes had been in effect for some time before the patient realized their presence. Estimates of size are seldom satisfactory, and this study is no exception to the rule, for the lesions are variously and not very exactly described as the size of the thumb, of the fist, of an orange, and of a pineapple. In one instance the tumor hung almost to the knees and approximated the Hottentot apron in appearance, while the ulceration of the entire surface was intolerably foul.

This particular patient exhibited also multiple uterine fibroids which were visible on a casual inspection of the abdomen, and two other women had the same type of tumor, which is, as is well known, exceedingly frequent in the colored race. Salpingitis was noted in only one case, which is surprising, in view of the high incidence of this disease in colored women. One patient had a chronic nephritis. In two cases there were characteristic maculopapular rashes, while chaneroid occurred three times and chancre once. Whether the chancre represented a re-infection or is to be explained in some other way is an interesting field for speculation.

The age range was from twenty to forty-nine years, the majority of the patients (15) being between twenty and thirty years and the number diminishing with each succeeding decade. The age incidence is what one would expect; since syphilitic infection is a predisposing factor, the incidence of syphilis will naturally be highest in the years when syphilitic infection is most likely to be acquired. To consider the subject from a different angle, the comparative infrequency of vulvar elephantiasis in older women may perhaps be explained also on the basis of the lessened lymphatic circulation which is characteristic of advancing years.

The complaints registered on admission are quite typical of the race from which they emanated. Although a degree of hypertrophy that must have made locomotion at least inconvenient was noted in every instance, only 19 patients specifically complained of it. Local pain was complained of in only 5 cases, perhaps because of the lessened sensibility of the negro upon which we have already commented. Local itching and burning on urination were frequent complaints. Four patients complained vaguely of "pain in the stomach," for which examination disclosed no reason and which does not seem a logical symptom of elephantiasis. One is forced to the conclusion, based on a long experience with negro women, that because they are inarticulate they resort to a

complaint of "pain in the stomach" whenever they are afflicted with some discomfort for which they are unable to find the proper words.

The local physical findings included involvement of the entire vulva in 11 cases, unilateral hypertrophy of the labia in 5, hypertrophy of the labia minora in 4, and of the clitoris in 7. In 18 cases, 70 per cent of the series, ulceration was marked, this high percentage being about what one would expect in a race whose ideas of personal hygiene are frequently elementary. While a general glandular enlargement was noted in 3 cases, in only one instance was it stated specifically that the inguinal glands were not involved. This may, of course, mean that the findings were uniformly negative, but we are inclined to doubt this conclusion.

Blood studies were done too infrequently to warrant comment, and while pus cells were found persistently in the urine of all patients who exhibited ulcerative lesions, this finding in a noncatheterized specimen has little practical significance. Cervical smears were not taken routinely in the early years of this study, and in the tests made only one positive finding (gram-negative intracellular diplococci) was reported, the high percentage of negative results being quite typical, although specific disease is very frequent in the colored women. Donovan's bodies, the organisms of granuloma inguinale, were apparently not looked for in any case.

In the cases which occurred prior to 1921 the blood Wassermann was not done routinely, and 9 fall into this group. In the other 17 cases the Wassermann test was positive (plus 3 or plus 4) in 8, almost 50 per cent of this group, and negative in 9, although in 4 of the latter clinical syphilis was either present at the time of the examination, or, judging from the history, had been present earlier. Thus 71 per cent of the cases studied from this standpoint furnish either a serologic or a clinical diagnosis of syphilis, and offer additional proof of the importance of the syphilitic factor in the production of elephantiasis of the vulva.

Two of the patients were such poor risks that operation could not be considered, and they were discharged after local treatment of a purely palliative character. Four other patients refused operation and signed discharge slips releasing the hospital of responsibility for them. In the remaining 20 cases surgery was done, the operations being performed by 16 different men. In 2 cases unilateral removal of the labia was considered sufficient, in the other 18 a more or less complete vulvectomy was performed, in 7 instances the clitoris being included in the excision. Local analgesia was employed twice and spinal 5 times; the remaining operations were done under general anesthesia.

It is generally granted that the electrocautery or the radioknife is ideal for extensive cases of vulvar elephantiasis because by this technic tissues are sealed as excision is done and the need for sutures is either entirely eliminated or greatly reduced. That a broad mass of surface

is left to heal by granulation, with resulting distortion and contraction, is not a valid objection in a disease in which these features are already marked. Either the radioknife or the electrocautery was used in practically all of the later cases in this series.

Drainage was done routinely in the cases associated with ulceration. In 3 instances the wounds were packed or were left open to heal by granulation, the area of excision being so extensive that approximation of the edges was impossible. In all other instances the wound was closed more or less completely by silkworm or catgut sutures, which usually remained in place until the eighth day.

Preoperative treatment consisted of measures to secure local cleanliness, chiefly douches, sitz baths and irrigations. The importance of clearing up extensive ulcerated areas and eliminating foul discharges prior to operation is so obvious as not to need comment. Antisyphilitic treatment was instituted on both laboratory and clinical indications. Both the local and the constitutional treatment was continued postoperatively, and the use of drying powders was particularly effective in the larger wounds. Healing is notoriously slow in diseases of this sort, owing to the poor nutrition of the parts and the practical difficulties of preventing infection, and it is not surprising that sloughing occurred in 8 cases. In 4 cases, in each of which the clitoris had been removed, postoperative catheterization was necessary.

Eleven patients had a febrile reaction above  $100.4^{\circ}$  F., which was considered normal for the condition, in several instances the temperature reaching  $104^{\circ}$ . The reaction lasted on an average ten days, the longest duration being twenty-three days. The hospital stay days varied from seven to sixty and averaged twenty-three.

One patient, a young woman, twenty-four years of age, developed a right basal pneumonia the day after operation. Whether this was the exacerbation of a previous, undetected respiratory infection, or whether it was a true aspiration pneumonia is not clear, though it should be remarked that the latter condition as a postoperative complication is not very usual in the South. Her recovery was prompt. A second patient had a rather severe local hemorrhage shortly after operation, which was controlled, with some difficulty, by the application of additional sutures under anesthesia.

Two of the 20 surgical patients died, one from acute myocarditis on the fourth day postoperative, the other from pelvic peritonitis on the twentieth day. The diagnosis in each instance was verified by autopsy. It is perhaps more than mere coincidence that these women were the oldest patients in the series, forty-three and forty-nine years of age respectively. One of them, the older, is so typical of her race and its reaction to illness that special mention might be made of her. She exhibited the very large, ulcerated overgrowth which has already been described, and she had a uterus several times its normal size due to the presence of multiple fibroids which were causing menorrhagia. She

was extremely toxic on admission, and preoperative treatment, although undertaken intensively, had little effect on either her general or her local condition. Operation was therefore done without further delay, with the idea of ridding her of her source of infection, although it was realized that she was not a good surgical risk. The excision of the vulva, even with the electrocautery, was exceedingly tedious, the procedure occupying the better part of an hour. Her immediate postoperative reaction was quite satisfactory, but the toxemia persisted in spite of every effort to overcome it, and death finally occurred on the twentieth day from pelvic peritonitis. It seems incredible in this medically enlightened age that even an ignorant woman could permit herself to reach such an advanced stage in a disease that is not generally supposed to threaten life, but physicians who have had much experience with colored patients know that such instances of neglect are only too frequent.

It is interesting to note that all the pathologic findings stressed as essential by Ravogli were noted in some combination in all the cases in this series. Malignancy was not a factor in any instance, and one wonders why, since chronic irritation is certainly a notable feature of the disease.

#### SUMMARY

1. Elephantiasis is a clinical and pathologic entity in which the essential pathologic change is not so much the edema which is the result of lymph stasis as it is a fibromatosis or hypertrophy of the underlying connective tissue.

2. While lymph stasis is an essential step in the development of the disease, and can be caused by any type of trauma or infiltration, the hypertrophic changes of the underlying connective tissue cannot occur until another factor, generally granted to be infection of some sort, has been superimposed. The streptococcus is the commonest infecting agent, but any other organism might be responsible. The intermediate step of infection is necessary even in the type of elephantiasis caused by filariae and other parasites.

3. Elephantiasis of the vulva, the pathology of which is set forth in some detail, is in the opinion of many observers caused by syphilis in the majority of cases. Proof of this conclusion is adduced.

4. A series of 26 cases from the records of Charity Hospital in New Orleans is presented in some detail. All of these cases occurred in colored women, the majority of whom were in their twenties and early thirties. In nearly three-quarters of all cases clinical or serologic syphilis could be demonstrated, and in practically the same percentage ulceration was a factor, the portal of entry for the infection thus being clear. The symptomatology, physical findings, mode of treatment, postoperative course and immediate results are reported.

## REFERENCES

- (1) *Elliott, J. A.*: Am. J. Cutan. Dis. 35: 17, 1917. (2) *Green, T. M.*: Ann. Surg. 71: 28, 1920. (3) *Hill, L. L.*: Surg. Gynec. Obst. 21: 334, 1915. (4) *Low, D. J.*: Tr. Royal Soc. Trop. Med. & Hygiene 17: 77, 1923. (5) *Matas, R.*: Am. J. Trop. Dis. 1: 60, 1913. (6) *Ravogli, A.*: J. Cutan. Dis. 25: 61, 1907. (7) *Ravogli, A.*: Lancet-Clinic 115: 573, 1916. (8) *Robinson, D. O.*: J. Cutan. Dis. 31: 573, 1913.

NOTE: The reader is referred to the excellent bibliographies attached to Ravogli's papers for the full literature on the subject.

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## AN ANALYSIS OF 220 CASES OF ABDOMINAL CESAREAN SECTIONS\*

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THIS analysis is an attempt to record the details of the abdominal cesarean sections performed in Atlanta's larger hospitals during the five-year period from 1925 to 1930. Other abdominal sections were performed in smaller institutions, but incomplete records could not supply the desired information and these were not included in the survey.

The seven hospitals cooperating in the survey were as follows: Wesley Memorial, Georgia Baptist, Crawford W. Long Memorial, Piedmont, St. Joseph's, and the white and colored units of Grady Memorial Hospital. The latter is the charity hospital for the city.

For comparative purposes, an effort is made to follow the outlines of similar analyses from other cities.

### INCIDENCE OF OPERATION AND DEATH

As noted in Table I, 20,286 women were delivered in the seven hospitals during the five-year period, with 220 abdominal sections, an inci-

TABLE I. INCIDENCE OF OPERATION AND MORTALITY

HOSPITAL	TOTAL DELIV.	CESAREAN SECTIONS	INCIDENCE OPERATION	DEATHS	PER CENT MORTALITY
A	2396	49	1 to 48	4	8.2
B	1071	62	1 to 17	4	6.4
C	1026	19	1 to 54	0	0
D	2668	44	1 to 60	2	4.5
E	5054	18	1 to 280	2	11.1
F	7087	14	1 to 506	0	0
G	984	14	1 to 70	0	0
Total	20286	220	1 to 92	12	5.5

\*Read before the Fulton County Medical Society, November, 19, 1931.

dence of one in 92 hospital deliveries. Twelve women died following operation, an incidence of one death in 18 operations, or a mortality rate of 5.5 per cent.

The incidence of operation varied from one in 17, to one in 506 hospital deliveries. The mortality rate varied from zero to 11.1 per cent. The 220 operations were performed by 48 operators, only 7 of whom did more than 12 operations each. The greatest number of operations performed by any one operator was 21.

#### TYPES OF OPERATION

TABLE II. DETAILS OF DIFFERENT TYPES OF OPERATION

TYPE	NO.	INCIDENCE	PER CENT	DEATHS	INCIDENCE OF DEATH	PER CENT MORTALITY
Classical	190	1 to 1.1	86.4	11	1 to 17	5.8
Low cervical	21	1 to 10	9.5	1	1 to 21	4.8
Porro	9	1 to 24	4.1	0	0	0
Total	220	1 to 92	1.8	12	1 to 18	5.5

Only 5 of the 48 operators attempted the low cervical type of operation. Eight of the 11 deaths following the classical sections occurred within six days after the operation. The woman dying after the low cervical section lived thirty-one days.

#### GENERAL CONSIDERATIONS

The incidence of cesarean section was 0.7 per cent higher in 1928 than in any other year comprising this analysis.

It was found that 91.8 per cent of the women had reached the eighth calendar month of pregnancy, and that 62.8 per cent were at term.

Only 4.2 per cent were considered over term by the attendants.

The age of the patients varied from fifteen to forty-two years.

Primigravidae made up 55.9 per cent of the series.

#### DURATION OF LABOR

In 59.6 per cent, labor had not started when the operation was performed. Of the women in labor, 30 per cent were in labor less than twenty-five hours; 2.7 per cent between twenty-five and forty-five hours; 2.3 per cent between forty-five and sixty hours; and 2.7 per cent were in labor between seventy-two and one hundred and forty hours before the operation was performed. Of ten women in labor sixty or more hours, three were delivered by classical section followed by removal of the uterus; two by classical section; and five by low cervical operation. The long labors, with the exception of four, were among colored women at the charity hospital. Here, the low cervical type of operation shouldered the responsibility of potentially infected cases and carried through without a mortality. The Porro operation was performed in all frankly infected cases.

## CONDITION OF THE MEMBRANES

In 81.8 per cent of the women, the membranes had not ruptured at the time the operation was performed. It was found that 7.7 per cent of the 13.6 per cent whose membranes had ruptured, were not ruptured longer than ten hours before the operation was performed.

## VAGINAL MANIPULATIONS

In 37.8 per cent of the series, the nurse's record revealed that vaginal examinations were made from one to twenty times preceding the operation. Twenty charts gave evidence of vaginal manipulation or examination, at home, before the patient was admitted to the hospital. Vaginal manipulations, excluding examinations, include the following: unsuccessful attempt to insert a bag; vaginal packing at home to control hemorrhage, while the patient was being transferred to the hospital, in two instances; unsuccessful attempts to deliver with forceps, followed by failure to perform version in two instances. In one of the latter cases the baby was diagnosed as dead before the section was performed.

## INDICATIONS

The indications for the 220 operations are recorded in Table III. An effort was made to group them under the outstanding indications, where multiple indications were found.

TABLE III. INDICATIONS

INDICATION	NO.	PER CENT	INDICATION	NO.	PER CENT
Contracted pelvis	40	18.1	Impacted trans. present.	2	0.9
Placenta previa	33	15.0	High arrest of head	2	0.9
Dystocia	23	10.4	Pernic. naus. and vom.	1	0.45
Eclampsia	23	10.4	Abscessed kidney	1	0.45
Preeclamptic toxemia	18	8.1	Prolapsed cord	1	0.45
Prev. cesarean (cont. pelv.)	18	8.1	Antefixation of uterus	1	0.45
Prev. cesarean (indic. ?)	15	6.7	Tuberculosis, steriliz.	1	0.45
Abruptio placentae	5	2.2	Fibroid uterus	1	0.45
Dead babies (previously)	5	2.2	Herniated uterus	1	0.45
Deflexed attitudes	4	1.8	"Too large baby"	1	0.45
Unyielding cervix	4	1.8	Chronic lung abscess	1	0.45
Nephritic toxemia	3	1.3	Double uterus	1	0.45
Preservation perineorrhaphy	3	1.3	Desire to sterilize	1	0.45
Myocarditis	3	1.3	Desire to sterilize and repair		
Pulmonary tuberculosis	2	0.9	hernia	1	0.45
Fibroid obstructing labor	2	0.9	Not stated	3	1.35

Of the 58 women credited with contracted pelvis, it was found that 18, or 31 per cent had previously been delivered by cesarean section. Nineteen of the 58 women gave histories of one or more deliveries through the pelvis, resulting in loss of the baby. One death occurred in this group, a mortality rate of 0.55 per cent. This woman died of general peritonitis five days after the operation. The morbidity for this group was 27.6 per cent.

Twenty-two of the 33 women listed as having placenta previa were multiparas. In two instances the placenta previa was complicated by a contracture of the pelvis. In 75.8 per cent of the cases the women were not in labor at the time of the operation. Seventy-five per cent of the placenta previa group were eight or more calendar months pregnant. The maternal mortality for this group was 3.1 per cent. The fetal mortality was 21 per cent.

Under the heading "dystocia," is included all patients who the attendant decided would be unable to deliver through the pelvis. Probably the term "failure to progress" would be more appropriate, including both dystocia and inertia, because only a few charts gave the cause of the dystocia, or differentiated primary and secondary inertia. Twenty-three, or 10.4 per cent of the sections were performed under this indication, 16 of which were done after the women had been in labor thirty or more hours. Two women died as a result of the operation, a mortality rate of 8.7 per cent for the group. A morbidity rate of 78 per cent was the highest of all the groups.

Eighty-two per cent of the eclamptics were given advantage of consultation before the operation was performed. In no other group was consultation called in over 18 per cent, and this was in the placenta previa group. An effort was made to control the convulsions in 48 per cent of the women before the operation was performed. Primiparous women made up 95.6 per cent of the eclamptics. Four of these, two of whom were at term, had contracted pelvis. Eighteen, or 78.3 per cent of the eclamptics were not in labor. Emptying of the uterus stopped the convulsions in 78.3 per cent. One eclamptic patient died after the operation, a mortality rate of 4.3 per cent. Death occurred six days after the operation from general peritonitis. The fetal mortality was 35 per cent. The morbidity for this group was 48 per cent.

Eighteen, or 8.1 per cent of the operations were performed because of preeclamptic toxemia. Two-thirds of these women were primiparas, and 83 per cent of them were not past eight and a half calendar months of pregnancy. Contracture of the pelvis was listed as a complication in three charts, yet in all three instances the pregnancies were not beyond eight and a half months. The heaviest baby delivered of the three, weighed only 6 pounds and 12 ounces. Other indications, in addition to the toxemia, include: four women previously delivered by section; one polyhydramnion delivered of an anencephalic monster; in two charts, inertia was listed as a complication after the women had been in labor longer than twenty-five hours. It was found that 72 per cent of the preeclamptic patients were not in labor at the time of the operation. The mortality rate for the preeclamptic group was 5.5 per cent. The fetal mortality was 28 per cent. The morbidity was 55.5 per cent.

Of the previous abnormal deliveries, it was found that 14.9 per cent of the 220 women had been delivered previously by cesarean section,



one or more times, only 0.9 per cent of whom had been delivered by the low cervical type of operation. Thirty-three women had had previous cesarean sections, five of whom had had two sections each. Two women had previously been delivered by the low cervical operation. In 11 instances, the first baby had been lost as a result of a difficult forceps delivery, and 4 women had lost 2 babies each because of the same difficulty.

The following is worthy of emphasis: A primiparous woman had a spontaneous, normal labor, and delivery of a living baby at the end of gestation. She was delivered by forceps at the end of her second pregnancy and the baby was lost. A cesarean section terminated the third pregnancy because of the difficulty that had been experienced with the second. Another cesarean section was done at the end of the fourth pregnancy and the woman died of peritonitis.

Two women lost two babies each from difficult breech extractions. One woman had a rupture of the uterus during her first labor, losing the baby.

Of the women who had had previous cesarean sections, 17 were not in labor at the time of the second operation. Of the 16 who were in labor, 75 per cent were in labor less than five hours before the operation was again performed. In 4 instances, the scar of a previous section was subjected to the strain of labor between ten and twenty-four hours before another section was performed. Investigation has shown that the uteri of 4 of these 220 women ruptured during later pregnancies or labors. Three of the mothers and all of the babies were lost.

#### ADDITIONAL OPERATIONS

Sterilization was performed in 51 instances, or in 23.1 per cent of the series. Nine other women were left sterilized because of the Porro operations. Small subserous fibroid nodules were enucleated in four instances. The omentum was adherent to the scar of a previous section three times and required resection. There were two ventral hernias that were repaired following the operation. Unilateral ovarian cysts were removed in two women. An appendectomy was performed 7 times. Of the 51 women sterilized, including the 9 Porro operations, 20 women were made "one child mothers."

#### STERILIZATION

Twenty-three per cent of the women were sterilized at the time of operation. Thirty-four of the 51 women undergoing their first cesarean section were sterilized; 58 per cent of the women undergoing the second operation were sterilized; and 40 per cent of the women undergoing the third operation were sterilized. Thirty-nine per cent of the women sterilized, including the Porro cases, were primiparas. Contracted pelvis led the list as the indication for the sterilization of primiparas.

## PORRO OPERATIONS

The Porro operation was resorted to 9 times, and in 5 of these the women were primiparas. Three of the women were less than twenty-two years of age. The indications for removal of the uterus in primiparous women were as follows: infected uterus in 3 instances, and fibroids of the uterus in 2 instances.

## MATERNAL MORTALITY

Space will not permit the details of each maternal death; however, the important findings on the charts of women dying following cesarean sections are recorded in Table IV. Note the relation of mortality and ruptured membranes, and also that all of the women had vaginal manipulation or examinations before the operation. In 3 instances, additional operative procedures were carried out at the time section was performed. Note the incidence of general peritonitis following "speedy operations."

TABLE IV. MATERNAL DEATHS

INDICATION	T	P	B.O.W.	VAG. EXAM.	HOURS LABOR	ADDIT. OPERAT.	OPERAT. TIME MINUTES	CAUSE OF DEATH	DAY OF DEATH
Prolapse of cord	N	N	Rupt. Time?	2	Not Stat.	None	33	Perito- nitis	9
Fibroid obst. labor	N	N	Rupt. 4 hr.	4	8 hr.	None	20	Perito- nitis	8
Cephalopelv. disp.	N	N	Rupt. 2 hr.	3	3 hr.	None	25	Perito- nitis	4
Previous dead babies	N	N	Rupt. Time?	2	Not Stat.	None	25	Perito- nitis	4
Inertia	N	90	Rupt. Time?	4	Not Stat.	Appen- dectomy	120	Perito- nitis	6
Previous cesarean	N	N	Intact.	1	Not in Labor	Steri- lized	42	Perito- nitis	4
Placenta previa	N	136	Rupt. 3 hr.	3	Not Stat.	None	44	Perito- nitis	4
Eclampsia	N	90	Intact.	1	Not in Labor	None	25	Perito- nitis	6
Preeclamp. toxemia	99	138	Intact.	1	Not in Labor	None	40	Pulmonary edema	12 hr.
Cephalopelv. disp.	N	N	Rupt. 5 hr.	2	18 hr.	None	38	Ether pneumonia	6
Inertia	101	106	Rupt. 15 hr.	1	40 hr.	Steri- lized	82	Septic pneumonia	31
Impacted trans. pres.	102	126	Rupt. Attem. Time? Vers.		Not Stat.	None	105	Metastatic bacteremia	21

## MORBIDITY

A temperature of 100.4° or over, occurring after the first forty-eight hours, was used as a standard for determining morbidity. The morbidity for the classical operations was 41 per cent; for the low cervical operations, 38 per cent. The febrile reactions include all intercurrent dis-

orders present, as it was impossible to obtain data explanatory for rises in temperature, due to many poorly kept progress notes. If immediate postoperative temperature elevations are included, the morbidity for the classical and low cervical operations is 59 and 66 per cent, respectively.

#### FETAL MORTALITY

Table V shows the details of the fetal deaths. Of the 225 babies delivered, including 5 sets of twins, there were 37 stillbirths and neonatal deaths, a fetal mortality of 16.4 per cent.

TABLE V. FETAL DEATHS

DEATHS ACCORDING TO INDICATIONS		CAUSES OF FETAL DEATHS		
	NUMBER		NUMBER	PER CENT
Eclampsia	8	Prematurity	20	54.0
Placenta previa	7	Toxemia	1	2.7
Abruptio placenta	4	Abruptio placentae	4	10.6
Previous cesarean	3	Ruptured uterus	1	2.7
Contracted pelvis	2	"Stillbirth"	1	2.7
Nephritic toxemia	2	Tentorial tear	2	5.4
Myocarditis	1	Cause not stated	5	13.6
Ruptured uterus	1	Diagnosed as dead before operation	3	8.3
Pulmonary tuberculosis	1			
Abscessed kidney	1			
Two previous dead babies	1			
Preeclamptic toxemia	5			

It is interesting to note that autopsy revealed the cause of fetal death in two instances as due to intracranial bleeding, both of whom were delivered by classical section. It was also found that three known dead babies were delivered by section, not including the abruptio placentae cases. The fetal mortality in eclampsia was 34.8 per cent; in placenta previa, 21.2 per cent; in preeclamptic toxemia, 27.7 per cent; and in abruptio placentae, 80 per cent.

#### ANESTHESIA

Ethylene was used in 26.8 per cent of the cases; nitrous oxide in 21.8 per cent; drop ether in 20.4 per cent; local infiltration of novocaine in 9.6 per cent; and local infiltration of novocaine plus an inhalation anesthetic in 12.8 per cent. It was observed that when an inhalation anesthetic was administered longer than ten minutes before the operation was started, some effort to resuscitate the baby was necessary. This was particularly true when nitrous oxide or ether anesthesia was used.

The author wishes to express his appreciation to the operators and superintendents of the seven hospitals for the privilege of reviewing and reporting this material, and for their aid in making this study possible.

692 NORTH HIGHLAND AVENUE, N. E.

## PRIMARY OVARIAN PREGNANCY

### REPORT OF A CASE WITH DECIDUAL REACTION

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THE case of ovarian pregnancy presented here fulfils the four criteria prescribed by Spiegelberg<sup>1</sup> in 1878. The fetal sac is contained in part in the cavity of a corpus luteum suggesting that the ovum was fertilized within its own graafian follicle. The chorionic villi present are for the most part intact and decidual cells are found in locations similar to those in ectopic pregnancies elsewhere. The gestation sac contains a fetus 26 mm. long which is well formed although somewhat macerated.

Although several hundred cases of primary ovarian pregnancy have been reported, less than 100 are accepted as genuine by those analyzing the reports liberally while those using most rigorous criteria accept many less.

Williams<sup>2</sup> in 1917 accepted 41 cases as genuine ovarian pregnancies. Sutton<sup>3</sup> in 1924 in a careful analysis considered 47 cases as proven. Frank<sup>4</sup> in 1927 accepted 64 cases whereas Strezoff<sup>5</sup> in the same year accepted 92 cases. Wollner<sup>6</sup> in 1932 accepted only 48 as true and 39 as doubtful.

Of the cases reported only a small proportion have shown part or all of the placenta within the corpus luteum and even less frequently has a fetus been recognizable.

Ovarian pregnancies form only a small percentage of the total number of extrauterine pregnancies. During the last ten years at the Mount Sinai Hospital of Cleveland there have been 148 cases of ectopic pregnancy, all but three of which were tubal, paratubal or tuboovarian. Of the other three, one occurred in the cornu of the uterus, one was a case of doubtful ovarian pregnancy, possibly paratubal or tuboovarian, and the third, the case of ovarian pregnancy presented here. In this small series, true ovarian pregnancy formed approximately 0.7 per cent of the total number of extrauterine pregnancies.

The patient, M. Z., white, German, was admitted to the Mount Sinai Hospital of Cleveland, March 30, 1932. Last menstrual period Feb. 14, 1932, normal, painless. Beginning March 7, 1932, which was a week earlier than expected, the patient bled moderately for seven days. Following this there was no more vaginal bleeding. The patient at this time began to notice a mild nausea which was referred to her substernal region. There was no vomiting. Her breasts became firm and painful. March 25, 1932, she experienced sharp lower abdominal pain which disappeared an hour later. About

midnight, March 29, 1932, she experienced excruciating lower abdominal pain which rapidly extended upward across the abdomen and was referred to the subcostal region. She was nauseated but did not vomit and complained of thirst. The physician (G. M. H.) was called the following morning at 7:00 A.M.

The patient had an appendectomy for acute appendicitis twenty-five years ago in Germany. Eight years ago following the birth of her only child, she developed a high rectovaginal fistula.

On admission the patient showed definite anemia and apparently was in acute pain. The abdomen was distended and tender with shifting dullness. The cervix was soft, the fundus slightly enlarged and forward. Slight cervical movement produced much pain. An indefinite boggy mass was present in the culdesac. The heart and lungs were normal. White cells 8400, red cells 3,450,000. Hemoglobin 75 per cent. Urine normal. Preoperative diagnosis: Ruptured ectopic pregnancy.

*Operation:* On opening the peritoneal cavity a large quantity of blood escaped. Several large clots were also removed. A large, fixed mass was present in the right adnexal region. This was delivered with some difficulty as the right tube and ovary were firmly fixed deep in the culdesac. The right tube was elongated and showed obliteration of the fimbriated end. The right ovary was attached to the uterus by the ovarian ligament. It measured five to six cm. in diameter and contained a large hemorrhagic mass. A small fetus was present in this ovarian mass. The left fallopian tube, ovary, and uterus appeared normal. A right salpingo-oophorectomy; and left salpingotomy was performed. A postoperative diagnosis of right ovarian pregnancy was made. Convalescence was uneventful and the patient was discharged from the hospital April 8, 1932, ten days postoperative.

*Pathologic Findings.*—The specimen consisted of right ovary and tube. On reconstructing the ovary, it formed a roughly spherical mass measuring approximately 5 by 4 by 4 cm. Along the external surface of the mass, ovarian tissue was grossly recognizable with a characteristic corpus luteum measuring approximately  $2\frac{1}{2}$  cm. in long diameter, the collar of yellow lutein tissue measuring approximately 4 mm. in width. The corpus luteum overlay a mass of reddish brown friable tissue grossly suggesting placenta and blood clot which in part occupied the cavity of the corpus luteum. In the central portion of the mass of placental tissue was a fetal sac about 3 cm. in diameter lined by smooth transparent membranes. The fetus was separate from the sac and was well-formed although somewhat macerated. It measured 20 mm. crown rump length and 26 mm. full length, these measurements corresponding to those of a fetus (in the uterus) of fifty to sixty days' pregnancy. In addition to the corpus luteum mentioned above, ovarian tissue was recognizable elsewhere on the external surface of the mass with a few small follicular cysts and corpora fibrosa recognizable on section. A portion of the ovarian ligament was present attached to the intact ovarian tissue.

The fallopian tube was entirely separate from the ovarian mass and measured approximately 7 cm. in length, a few times average short diameter (12 mm.) in distal portion and 5 mm. diameter in proximal portion. The distal opening was obliterated with the fimbriae not recognizable. The serosa of the fallopian tube was thickened and covered by a number of tags of fibrous tissue. On repeated section the lumen was moderately dilated in the distal half, no blood visible. The wall of the tube was thinner than average in the distal portion, firm, grayish white throughout.

Sections of the ovary showed characteristic lutein cells along the external surface. The cavity of the corpus luteum was filled with blood clot, with scattered chorionic villi, some intact, others degenerating. The intact villi were character-

istically those of early pregnancy, being coarse with small blood vessels containing nucleated red blood cells. In the region of the chorionic villi and about vascular slits along the inner surface of the corpus luteum there were islands of large cells with abundant cytoplasm (typical decidual cells). There were also a number of apparently involuting decidual cells in similar locations.

Frozen sections stained with Scarlet R and hematoxylin showed no orange-stained masses in the decidual cells while the regional lutein cells in the same



Fig. 1.—Gross photograph. Ovarian pregnancy showing corpus luteum in wall of gestation sac and fallopian tube separate from ovarian mass.

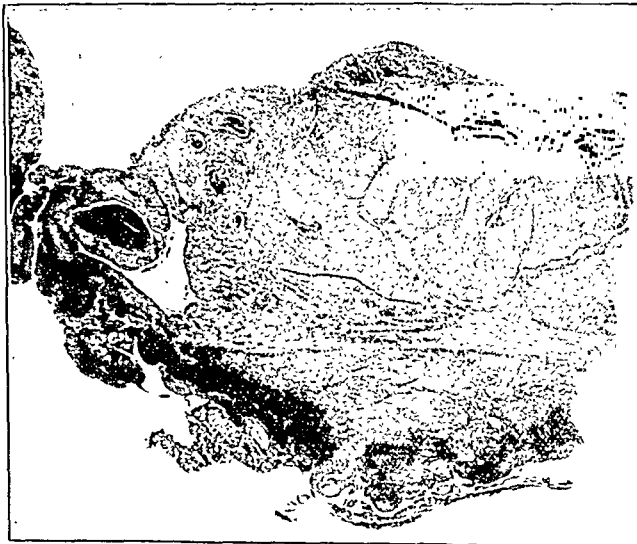


Fig. 2.—Photomicrograph. (Very low magnification). Ovarian pregnancy showing corpus luteum, chorionic villi, and portion of ovarian ligament.

sections showed numerous such colored granules uniformly distributed. There was a layer of organizing blood clot between the collar of lutein cells and the gestation sac, with a number of fibroblasts and macrophages containing orange to red globules apparently lipid particles. In places the trophoblasts covering the chorionic villi contained orange-stained droplets, these villi apparently degenerating.

Sections cut longitudinally through the fetus showed cartilage and voluntary muscle well-preserved. Other tissues were in considerable part autolyzed, although phantoms of liver cords were still recognizable.

Sections of ovary at a distance from the corpus luteum showed several prominent corpora fibrosa. Along the external surface there was a layer of fibrous tissue suggesting a moderate chronic perioophoritis.

Sections of the fallopian tube showed the lumen dilated, the plicae thickened and flattened with some increase in fibrous tissue in the wall, slight round cell infiltration. A moderate number of red blood cells were present in the lumen. The outer coats were thickened by edema, with tags of fibrous tissue covering the serosa. There was no evidence of placental or decidual tissue in any portion of the fallopian tube.



Fig. 3.—Photomicrograph. (Low magnification). Ovarian pregnancy showing chorionic villi and decidual cells. (Hematoxylin and eosin stain.)

The four requirements of Spiegelberg were fulfilled in this case. That the fallopian tube on the affected side was intact and that the fetal sac occupied the position of the ovary can be seen from Fig. 1. That the fetal sac was attached to the uterus by the ovarian ligament was noted at the time of surgical removal when the ligament was clamped and cut. A portion of the ovarian ligament was left attached to the ovarian mass and can be seen in Fig. 2.

Webster<sup>9a</sup> and Williams<sup>9b</sup> in 1904 and later Sutton<sup>3</sup> in 1924 present evidence in support of the occurrence of decidual reaction in ovarian pregnancy, while Bryce, Kerr and Teacher,<sup>7</sup> Mall and Cullen<sup>7</sup> and Norris<sup>10</sup> do not accept the possibility of a decidual reaction in the ovary in ovarian pregnancy. Recently Jordan<sup>11</sup> in 1932 while suggesting the possibility that the cells in question may be decidual cells interprets them as aborted lutein cells.

From the statements made by these various investigators it is apparent that one type of large cell in ovarian pregnancy has been variously interpreted as trophoblast, lutein cell, and decidual cell. Although at times it is difficult to distinguish between these various cells it is likewise true that at times in properly prepared sections they are thoroughly distinctive.

In our case, the decidual cells, both those which are intact and those apparently involuting are found in locations similar to those in ectopic pregnancies elsewhere, namely, about blood vessels, in the wall of regional fixed tissue and especially in the region of penetrating chorionic villi apparently acting as a defense against invading trophoblast. The decidual cells do not show orange-stained particles in the Scarlet R

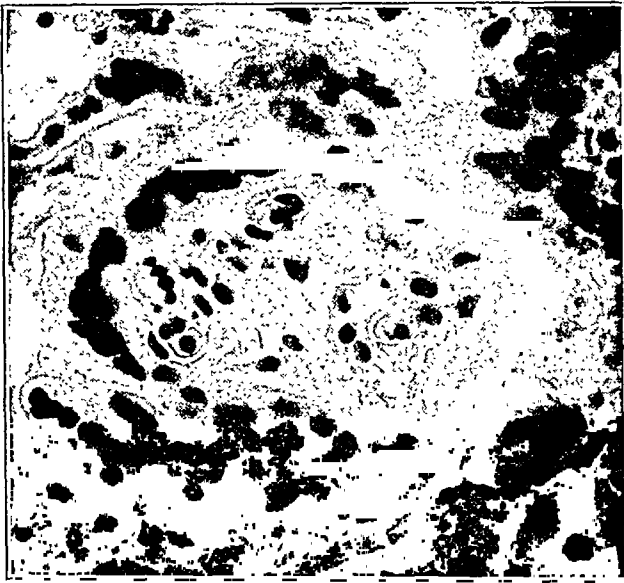


Fig. 4.—Photomicrograph. (High magnification). Ovarian pregnancy showing chorionic villi with nucleated red blood cells in blood vessels.

stained preparations whereas, the lutein cells show numerous fine orange-stained granules. The trophoblast in places shows no orange-stained granules, but in areas possibly degenerating numerous fine Scarlet R stained granules are present. In addition there are fibroblastic and monocytic cells with larger and irregularly Scarlet R stained masses. The significance of these findings cannot be stated since the staining reaction of intact lutein cells in the human ovary is not completely agreed upon. However, in our case no decidual cells showed Scarlet R stained granules and all lutein cells showed numerous fine granules. The relationship of the early degeneration of the pregnancy to the lutein cell granules should be considered.

The difference of opinion as to the presence or absence of decidual reaction in ovarian pregnancy may be reconciled by the observations



of Williams,<sup>12</sup> Polak and Wolfe,<sup>13</sup> Kline<sup>14</sup> and others in their observations on the decidual reaction in extrauterine pregnancies. Kline in a careful study of 74 cases of tubal pregnancy states: "In a study of 74 cases of extrauterine pregnancy, evidence was found for the belief (1) that a decidual reaction of greater or less extent occurs constantly at the site of implantation; (2) that the decidual tissue persists as long as the chorionic villi are intact; (3) that following the termination of the pregnancy by hemorrhage with resultant degeneration of the chorionic villi, the local decidual tissue undergoes involution, and (4) that a distant decidual reaction in other portions of the tube, uterus, or elsewhere is not constant and that when it does occur, it may persist after the degeneration of the chorionic villi and the complete involution of the local decidual tissue."

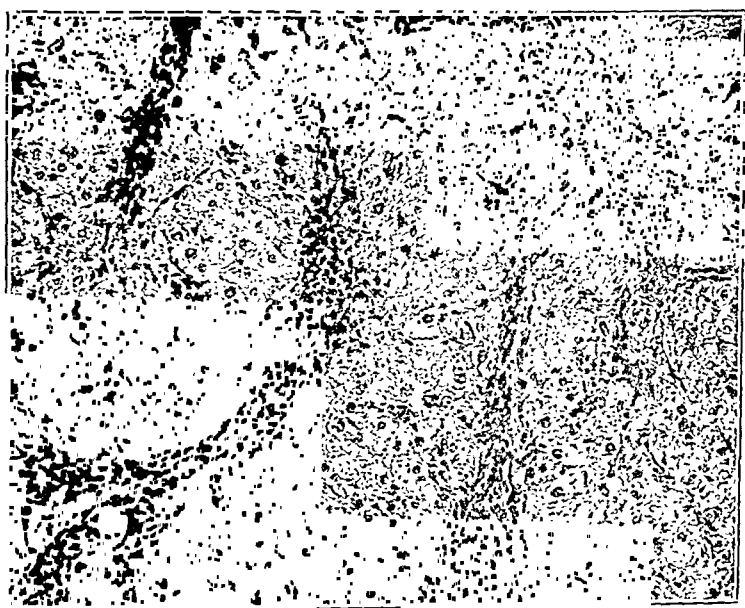


Fig. 5.—Photomicrograph. (High magnification). Corpus luteum showing fine granules in lutein cells. (Scarlet R and hematoxylin stain.)

In view of the observations in tubal pregnancy it seems probable that those who observed decidual or decidua-like cells in ovarian pregnancy observed cases in which the ovarian pregnancy was relatively intact, while those who found no evidence of a decidual reaction observed cases in which the pregnancy was degenerating or degenerated and consequently associated with involuting or involuted decidual cells.

There are several theories relating to the causation of primary ovarian pregnancy, all, however, agreed that two conditions must be postulated; first the ovum must be retained in its follicle and second the spermatozoon must gain access to the follicle.

It seems highly probable that retention of the ovum in the follicle occurs much more frequently than does ovarian pregnancy. In addition to lessening the expulsive power of the ovary slight variations in the re-

sistance of the follicular wall, such as may be produced by small bands of fibrous tissue following inflammation, may determine lines of force resulting in propelling the ovum against the wall of the follicle rather than through the orifice.



Fig. 6.—Photomicrograph. (High magnification.) Ovarian pregnancy showing decidual cells, phagocytic cells and lutein cells. (Scarlet R and hematoxylin stain).

The infrequency of ovarian pregnancy is probably in great part due to (a) infrequency of follicular retention or expulsion into the ovarian stroma of ova, and (b) unfavorable conditions for the penetration of spermatozoa through the follicular orifice.

#### REFERENCES

- (1) *Spiegelberg*: (Quoted by W. Williams). (2) *Williams, W.*: Obstetrics, ed. 5, 1926, D. Appleton & Company, p. 724. (3) *Sutton, L.*: AM. J. OBST. & GYNEC. 7: 1, 1924. (4) *Frank, R. T.*: Gynecological Pathology, ed. 2, 1931, D. Appleton & Company, p. 443. (5) *Stressoff* (Quoted by Jordan, et al.): Odessky M. J., 1927. (6) *Wollner, A.*: AM. J. OBST. & GYNEC. 23: 262, 1932. (7) *Mall, F. P., and Cullen, E. K.*: Surg. Gynec. Obst. 17: 698, 1913. (8) *Reinecki, H.*: Zentralbl. f. Gynäk. 55: 3243, 1931. (9a) *Webster, J. C.*: Trans. Am. Gynec. Soc. 29: 65, 1904. (9b) *Ibid.*: Discussion by W. Williams. (10) *Norris, C. C.*: Surg. Gynec. Obst. 9: 123, 1909. (11) *Jordan, H. E., Garrett, B. C., and Norfleet, W. J.*: Surg. Gynec. Obst. 54: 485, 1932. (12) *Williams, W.*: Obstetrics, ed. 5, 1926, D. Appleton & Company, p. 728. (13) *Polak, J. O., and Wolfe, S. A.*: AM. J. OBST. & GYNEC. 8: 730, 1924. (14) *Kline, B. S.*: AM. J. OBST. & GYNEC. 17: 42, 1929.

# CARCINOMA OF THE CERVIX IN A GIRL OF SIXTEEN

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MISS C. K., aged sixteen, was admitted to the Long Island College Hospital on August 19, 1927, complaining of a purulent vaginal discharge. The family history was irrelevant. At the age of four the patient had "congestion of the brain," and since has had a residual speech defect with retarded mentality. At the age of eight, tuberculosis of the right knee required surgical incision and cast was followed by a permanent ankylosis. Menstruation began at fifteen, recurred at irregular intervals of three to twelve months and lasted two to three days. The last period occurred June, 1927. The present illness began one year ago, with a foul purulent vaginal discharge which lasted for two months and then spontaneously subsided, only to recur in March, 1927, and has persisted in spite of vaginal irrigations. For two weeks prior to admission the discharge had been very profuse. The general physical examination was entirely negative except for ankylosis of the right knee joint. The laboratory data were essentially negative. Vaginal smears were found negative for gonococci.

On August 20, vaginal examination performed under gas oxygen anesthesia revealed a large cauliflower mass involving the entire cervix and filling the vagina. A biopsy was taken.

The report of the Gynecological Laboratory follows: Specimen was comprised of large tissue fragments which were granular, opaque, and suggestive of malignancy. Microscopically, the majority of the fragments presented a uniform picture. They were comprised of tumor cells divided into large and small alveoli by bands of hyalinized connective tissue (Fig. 1). Edema and hydropic degeneration were prominent characters. The constituent cells were sharply defined. The cytoplasm was faintly acidophilic and granular. The nuclei were round or oval in form, vesicular in type with moderate increment in chromatin contents. As a rule they were centrally placed. Variation in size, shape, and staining characters was not prominent. In an occasional fragment, however, small irregular gland spaces were reproduced (Fig. 2). These were lined by low columnar cells with scant cytoplasm. The round and oval nucleus practically completely filled the cell body. Where secretion had occurred, the lining cells had been compressed, and only the small flattened or ovoid nuclei were retained. Diagnosis: Embryonal carcinoma of the cervix. Comment: Appearance of epidermoid and adenocarcinoma was in conformity with derivation of glandular and epidermoid epithelium from embryonal müllerian elements in the cervix.

On August 25, under ether anesthesia, the cervical growth was excised by the cautery and 75 mg. of radium inserted in the cervical canal for twenty-four hours. The patient was discharged Sept. 16, 1927, as clinically improved. In the interval between Sept. 12, 1927, and Sept. 18, 1929, a series of 17 deep x-ray treatments were administered.

Numerous follow-up examinations were made after discharge from the hospital until Aug. 10, 1930. At all times the patient was free from vaginal discharge or bleeding. No traces of tumor were noted in the cervix. The parametria were found free from induration. Frequency of urination was a persistent complaint.

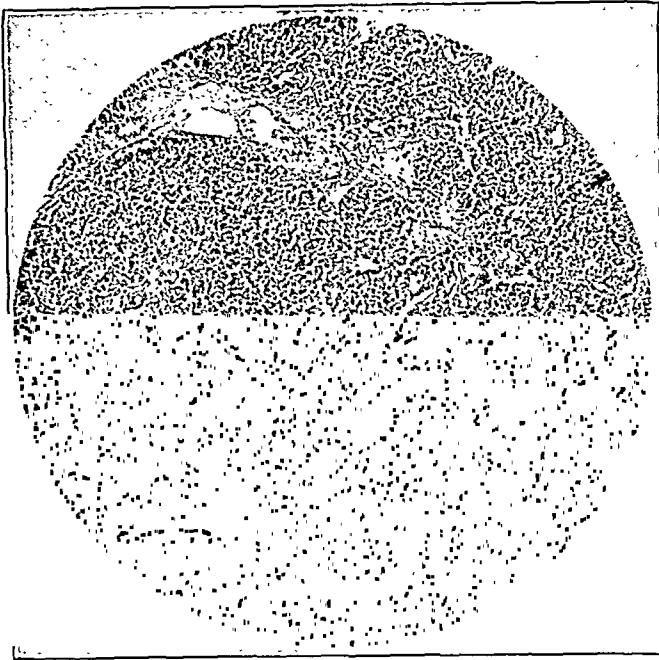


Fig. 1.—Biopsy from cervix shows a medullary and alveolar arrangement of tumor cells. Cytoplasm is scant. Buds well defined. Nuclei are centrally placed.



Fig. 2.—Biopsy from cervix. Differentiation of tumor cells into gland spaces. The lumen is wide and filled with secretion. The lining layer is low. Alveolar formation is also noted.

On October 21, 1930, patient complained of a poor appetite and a feeling of cold. This persisted until October 31, when pain appeared in the left shoulder and chest. Pain was not severe but was associated with a dry hacking cough. On November 2 patient became acutely ill, felt very weak and feverish. She was admitted to the Medical Service of the Long Island College Hospital with a temperature of 103°, pulse 112, respiration 30, the diagnosis was pneumonia in the left upper lobe.

In the interval between admission and her death at 6:15 P.M., November 9, physical findings, symptoms, and laboratory data remained relatively unchanged.

The condensed report of the autopsy performed by Dr. M. Rosenthal is as follows: The body was that of a young adult female. The contour was definitely masculine with hair distributed over the face and abdomen. A brownish pigmentation was noted over the thorax, upper and lower extremities. Emaciation was marked. Two oblique scars were noted above the right knee. Head and neck were essentially negative. During

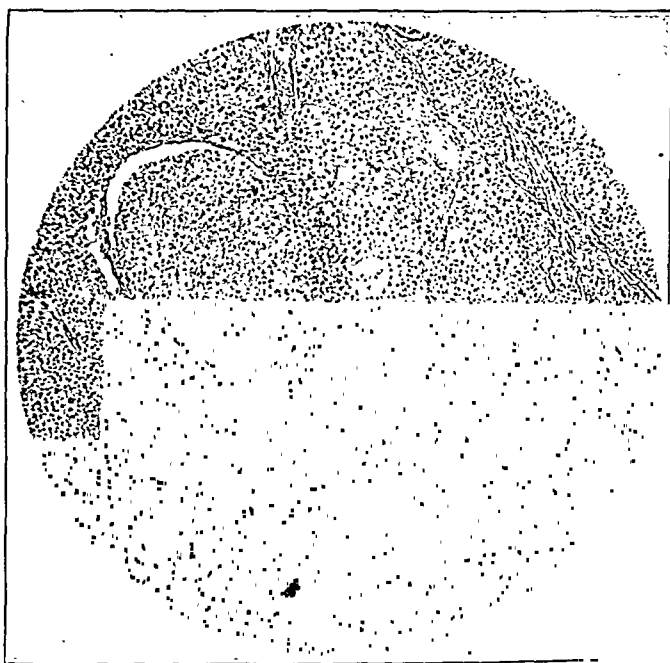


Fig. 3.—Pulmonary metastases. Tumor cells arranged in definite alveoli. Note sharply defined cell membrane, abundant cytoplasm and centrally placed nucleus. The tumor cells are reminiscent of epidermoid carcinoma.

removal of the left lung an abscess cavity was evacuated in the lower half of the upper lobe. On cross-section the apex of the left lung presented a gelatinous pneumonia. The left upper lobe itself was the seat of conglomerate tumor masses, varying from 1 to 30 mm. in diameter, reaching from the hilum to the pleural surface. Compression of the left main bronchus resulted in it being filled with mucus. Below the site of obstruction and involving the lower segment of the upper lobe, areas of bronchopneumonia with abscess formation were prominent. The lower lobe of the left lung presented several tumor nodules and scattered areas of bronchopneumonia. The right lung presented passive congestion and emphysema. The apex, however, contained a tumor nodule 1½ cm. in diameter. The heart, liver, spleen, kidneys, and gastrointestinal tracts were essentially negative.

Microscopically: Sections from the left lung revealed the tumor nodules arranged in irregular alveoli sharply defined by narrow connective tissue septa (Fig. 3). The component cells were round, oval in shape with a sharply defined cell

membrane and abundant granular cytoplasm. Hydropic degeneration was frequent. Variation in size, shape, and staining capacity were everywhere in evidence. Giant nuclei were not uncommonly noted. Similarity to the cells of the biopsy specimen was striking.

Section from the lower half of the lung revealed suppurative pneumonia. The right lung presented compensatory emphysema. The liver, kidneys, and spleen were essentially negative except for cloudy swelling.

The uterus was markedly atrophic, measured  $4\frac{1}{2}$  cm. from cervix to fundus, 32 mm. transversely at the level of the round ligaments and  $1\frac{1}{2}$  cm. in the anteroposterior diameter at the same level. The cervix comprised fully half the total length of the organ. The portio was smooth, covered by a normal squamous lining. The external os was round. On incision the arborae vitae were well demonstrated. The fibromuscular wall measured 8 mm. in thickness and was grossly fibrotic. No malignant tissue was apparent to the naked eye. The mucosa of the body and fundus was thin and congested. The muscular coat presented advanced atrophy and measured 6 mm. in thickness. The serous coat was normal. Multiple sections taken from the cervix, uterus, tubes, and ovaries revealed, microscopically, changes due to radiation atrophy with no evidence of residual carcinoma in the cervix or in any of the contiguous viscera.

Summary: A proved case of carcinoma of the cervix in a girl of sixteen. The constituent tumor cells showed differentiation into epidermoid carcinoma with areas of adenocarcinoma, thus simulating müllerian development into epidermoid and glandular epithelium. The onset with persistent vaginal discharge and findings of a cauliflower growth were characteristic. Excellent local response to radiation was observed for three years. Death ultimately followed as the result of pulmonary metastases and purulent bronchopneumonia. Postmortem study of the uterus and adnexa showed radiation changes. There was no trace of residual carcinoma.

#### REFERENCES

- Baldwin, L. Grant*: AM. J. OBST. & GYNEC. 21: 728, 1931. *Bonner, A.*: AM. J. OBST. & GYNEC. 14: 175, 1927. *Hirst, B. C.*: AM. J. OBST. & GYNEC. 18: 104, 1929. *Kehrer, E., and Newman, H. O.*: Monatsch. f. Geburtsh. u. Gynäk. 81: 68, 1929. *Morse, A. H.*: AM. J. OBST. & GYNEC. 19: 520, 1930.

159 CLINTON STREET.

**Paramore, R. H.:** A Case of Eclampsia Treated With Spinal Anesthesia, *Lancet* 219: 399, 1930.

In two previous patients spinal anesthesia seemed highly efficacious in stopping the eclamptic convulsions, but in this case the fits recurred. This individual had had omnopon and intermittent chloroform until spinal anesthesia could be given. Hot baths and enemas were supplemented after recovery seemed likely, but the eclampsia recurred in three days. Cesarean section and an incision of the right renal capsule under chloroform anesthesia were unsuccessful in terminating the disease. Twenty hours after the operation the second spinal anesthesia was administered, yet the last convulsion was eight hours later or twenty-eight hours after delivery.

Chloroform and omnopon had been liberally used to control the convulsions.

Even though it was not used in this patient, venesection is recommended for those having a small blood loss at delivery.

The infant did not survive. The patient left the hospital on the twenty-first day with slight albuminuria, and the loin incision healed.

H. C. HESSELTINE.

## A CASE OF TUBAL TWINS\*

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IN MARCH, 1923, Arey published in *Surgery, Gynecology and Obstetrics* a critical summary of all the then existing cases of tubal twins to be found in the literature. He recorded 40 cases that were positive or authentic, eight that were probable, and four possible but doubtful. Since the publication of this report I have been able to find nine other cases that seem to be definite which, with the case I wish to report at this time, would add ten more to the record. In the article referred to, a brief description of each case was given. A similar description of the new cases follows:

1. Kynoch, 1924. Tubal twin pregnancy. Six weeks' amenorrhea before operation. A large paratubal hematocele communicating with a swelling of the right tube. Pathologic report: "Tubal mole containing two embryos."

2. Harrar, 1927. Interstitial twin pregnancy with intraligamentous rupture, later becoming abdominal. One of the twins succumbed at the third month and was well on its way to become a lithopedion five months later. The other lived for seven and a half months until the rupture of the sac intraabdominally.

3. Paschal, 1927. Bones of two fetuses removed per rectum ten years after a pregnancy without delivery. A presumed case of an abdominal pregnancy with death of fetuses and years later ulceration of the bones through into the rectum.

4. Cutore, 1929. Twin tubal pregnancy with one chorion and one amnion. A multipara who had never had an abortion; last pregnancy eleven years ago. Sudden onset of abdominal pain forty-five days after her last period. At operation the left tube was found the seat of an ectopic gestation which on section was found to contain two embryos each about 19 mm. long, in a single amniotic cavity. One was normal and the other an exencephalus. There was a thin permanent fold present which may have been the remains of a partition between the two fetuses.

5. Nota, 1929. Left tuboovarian mass removed at operation. Pathologic report: "an ovid tumor 10 by 8 cm. unruptured." On section the cavity was lined with membrane resembling amnion. Two fetuses 62 mm. and 60 mm. long, about two months' gestation, were found, each had an umbilical cord inserted into a single placenta.

6. Deichgraber, 1931. A ruptured tubal twin pregnancy at six months. Fetuses about 30 cm. long each in its own amniotic sac were found in the abdominal cavity. The sacs were intact. The tube was ruptured and about half the placenta was outside the lumen partially attached to the omentum.

7. Tixier, 1931. Tubal twin pregnancy in a patient with uterine fibroid. At operation the tube was found ruptured with intraabdominal bleeding "grasping the tube with the hands expelled a placenta to which two small fetuses were attached." History is incomplete. Patient had no skipped period but had had continuous bleeding for six weeks before the operation. No pathologic description of the tube, placenta, or embryos.

8. Franchini, 1931. Twin abdominal pregnancy primarily tubal. Operation four months after the last menstruation. A sac containing two viable male fetuses about

\*Presented to the Obstetric Section of the Academy of Medicine, December 23, 1932.

four months old; each fetus attached by a cord to a single placenta adherent to the left side of the uterus in the culdesac and to the rectosigmoid. The fetuses were 20 cm. long and weighed 185 and 200 gr.

9. Bocquentin et Bruneton, 1932. Two months' amenorrhea preceded the onset of severe abdominal pain with vaginal bleeding, tendency to faint, etc. At operation left tube was dilated near the isthmus and had ruptured posteriorly. Examination of the specimen removed showed placental remains attached to the wall of the tube and two embryos  $1\frac{1}{2}$  cm. long, each attached by cords 3 cm. long to the same point in the placenta. Each within its own amniotic sac.

In analyzing the reports of all of the authentic cases, I find that one-half of them had advanced to between the sixth and twelfth week of gestation, and but one-fifth (20 per cent) had been of six weeks' duration or less. Of the nine early cases four had had rupture of the gestation sac, four were unruptured, and one not recorded.

Mrs. A. W., admitted to my private service on March 20, 1931. A white nullipara aged thirty-five.



Fig. 1.

Her menstrual history was normal. She had been married thirteen years and had 3 induced abortions with no complications.

Last regular period on Jan. 26, 1931, perfectly normal in every respect. Missed her February period, and on March twelfth began to have very slight, serosanguinous brownish spotting. On March fifteenth in the afternoon, patient had an attack of acute colicky pain in lower abdomen but felt better on going to bed. Next day when she arose was again seized with similar attack of pain. Since then spotting has continued as since onset and the pain returns when patient has been on her feet for several hours. Has not passed any clots or anything resembling products of conception. An enema caused pain throughout the abdomen. General condition very good. Had no nausea or vomiting at any time.

Pelvic examination showed a nulliparous introitus. No external evidence of infection. Cervix low, points forward, no marked pain on motion. Uterus incompletely retroverted. Adnexa prolapsed into culdesac. More tenderness on right than left. Diagnosis: Ectopic gestation.

Operation: March 21, 1931, partial right salpingectomy.



Vaginal examination was done under anesthesia. The cervix was long and the external os closed. The fundus was not enlarged but was retroverted with a mass fixed in the culdesac.

The abdomen was opened in the lower midline. A small amount of free blood was found in the peritoneal cavity. The adnexa was lightly adherent to the culdesac. The right tube at about  $1\frac{1}{2}$  cm. from the fimbriated extremity was enlarged 3 cm. The right ovary and left adnexa were both normal.

The outer third of the right tube was removed without disturbing the ovarian circulation.

The appendix was examined and found normal and not removed. The peritoneum was freed from blood and the wound closed in layers without drains.

Discharged in excellent condition April 5.

**Pathologic Report:** The tube presented an oval swelling which measured 3 by  $2\frac{1}{2}$  by 2 cm. The serosa over this mass was attenuated, with small areas of hemorrhage beneath the surface. On section, through the ectopic site, a well-defined amniotic cavity was found. From its anterior aspect arose the umbilical cords of a twin pregnancy. The embryos measured 11 mm. in length and were normally formed.

Microscopically the lining mucosa of the tube was retained. Pregnancy almost completely filled the tube lumen. The amnion was preserved, likewise the chorion laeve and chorion frondosum. The villi, however, presented areas of mucoid degeneration. The pseudo capsularis formed by the reflecting tubal mucosa was well preserved. Muscle coat thin and atrophic. Edema was prominent, serosa congested.

380 VANDERBILT AVENUE.

## KRAUROSIS VULVAE

GEORGE JOHNSON, M.D., WILMINGTON, N. C.

**CASE 1.**—Mrs. T., thirty-three years of age, was first seen on May 28, 1930. She had one child twelve years old and no abortions. Her complaints consisted of frontal headaches, nervousness, hot flushes, and pain in the lower part of her back, worse during the menses. Leucorrhea had been present since her child was delivered. There had been intense itching of the vulva for the past three years, which was great enough to awaken her at night. Her menses were regular, scanty, with pain before and during the flow. Physical examination showed a well developed, moderately obese white female. Her blood pressure was 168/74. The vulva was thick, leathery, whitish in color and presented signs of being scratched. The labia majora was flattened and the labia minora was small, thick, and inelastic. The clitoris was present but was small and leathery with a fissure to the left. The diseased tissue extended from the beginning of the mons veneris to the outer border of the labia majora and nearly to the anus. There was a clear-cut line of demarcation between the diseased and normal tissue. The urethral and vaginal mucosa appeared normal. The area that seemed most involved was the clitoris, labia majora, and fourchette, or where the fourchette should have been. The perineum was badly torn. The uterus was normal in size and shape but the cervix was lacerated and eroded. The treatment consisted of cauterization of the cervix, application locally of one dram of crude coal tar to one ounce of Lassar's paste and administration internally of ovarian emplets. The endocervicitis cleared very rapidly with cauterization and the leucorrhea was

lessened, but the severe pruritus continued. After nearly seventeen months of treatment and much persuasion she decided to undergo operation. On Oct. 7, 1931, under avertin and ether anesthesia, she had a vulvectomy, perineal repair, and appendectomy. She made an uneventful recovery except that she had to be catheterized for ten days following the operation. She had a slight return of the itching in the region of the mons, but the tissues appeared normal and I believe this to be of no consequence. The sexual act is satisfactory with response and she is delighted with the results from the operation.

CASE 2.—Mrs. B., a widow, fifty-five years of age, was first seen on Oct. 20, 1930. She had five children and no abortions. Her complaints were nervousness, hot flushes, palpitation, weakness, leucorrhea, and a vaginal irritation for the past few years. Her menstrual history was essentially negative and she had passed through the menopause five years before. Physical examination showed a well developed, well nourished white adult female. Her tonsils were infected. Her heart was fast and irregular but there were no murmurs. Her blood pressure was 200/110. The reflexes were exaggerated. Her urine contained a trace of albumin and a few hyaline casts. The vulva was whitish, thick, leathery, and presented some signs of scratching. The same area was involved as in Case 1, except in this case the process extended more around the anus and involved a hemorrhoid next to the perineum. There were fissures about the fourchette and on the right side of the labia majora there was a small elevated whitish plaque. The labia minora in this case were well developed and not very much involved. The perineum was lacerated and the cervix was lacerated and badly infected. The pelvis was negative except for an atrophic uterus. Remembering the experience with Case 1, she was told that probably she would have to have the diseased tissue removed which she was reluctant to do. The cervix was treated with endothermy and the leucorrhea improved, but the pruritus remained unchanged. After her tonsils were removed, the general condition improved, her blood pressure returned to normal and her urine became normal. After observation and treatment for a year, an excoriation appeared on the labia majora that would not heal. It was so sore that she could not scratch it, and the salves that had been given her for the pruritus burned her to such an extent that she could not use them. This excoriation had a firm base not unlike that of a syphilitic ulcer. After explaining to her that this might be a beginning malignancy, she consented to an operation. On Nov. 10, 1931, nearly thirteen months after she was first seen, she was operated upon under avertin and ether anesthesia. A complete vulvectomy, perineal repair, and removal of the anterior hemorrhoid were done. She was kept under the influence of barbituric acid preparations for the first four days. She voided the fourth day and except for a mild pyelitis, she made an uneventful recovery. All the pain left her on the tenth day, and on the twelfth day she could sit comfortably.

NORTH CAROLINA BANK BUILDING.

## COMBINED PREGNANCY

H. D. LAFFERTY, M.D., PHILADELPHIA, PA.

*(From the Department of Obstetrics, Hahnemann Medical College and Hospital)*

COMBINED pregnancy is that condition ensuing when nidation and growth of fertilized ova occurs simultaneously in and outside of the uterine cavity.

I. G., a white Italian, aged thirty-two, was referred to the hospital on Jan. 8, 1932, complaining of vaginal bleeding and crampy abdominal pain. There was no history of twin pregnancy in the family. The patient had typhoid fever at the age of thirteen, and an appendectomy was performed at the age of fifteen. Her menstrual periods began at the age of thirteen, occurring regularly every thirty days, with a fairly profuse flow lasting from six to seven days associated with some pain. She spontaneously delivered three full-term children, the puerperia being normal. The last pregnancy was six years ago. Ten years ago she was curetted for an incomplete abortion. The last menstrual period occurred Nov. 16, 1931. She admitted the taking of quinine to produce an abortion. A brownish vaginal discharge was first noted on Jan. 3, 1932, and five days later she began to note cramp-like abdominal pains, and hospitalization was advised. Upon admission the temperature, pulse, and respiration were normal. The patient complained of very little pain, and there was a very small amount of vaginal discharge. The abdomen presented a resistance just above the symphysis pubis. Vaginal examination revealed the physical findings of early pregnancy, but with an enlargement of the uterus greater than the period corresponding to the pregnancy, the uterus apparently being irregular. A diagnosis of a threatening abortion in a fibroid uterus was made. On Jan. 14, 1932, a Friedman test was positive, Hb 81 per cent, leucocytes 7600. She was observed until January 20, at which time the abdomen was investigated under nitrous oxide-oxygen-ether anesthesia, the plan being to perform a supravaginal hysterectomy because of the supposed fibroid complicating pregnancy. The right tube and ovary appeared normal. The left tube contained a pregnancy with impending tubal abortion. Examination of the uterus showed it to be symmetrically enlarged, and palpation gave the sensation as though there was an associated intrauterine pregnancy. A normal postoperative course followed except on the fifth postoperative day there was a rise of temperature to 103.2° with symptoms and physical signs of a pyelitis. This temperature dropped to normal and the patient was symptom free in twelve hours. On Jan. 26, 1932, a Friedman test was still positive. The patient had no vaginal bleeding from the time of operation until the evening of the twenty-seventh, one week postoperative, at which time there was vaginal bleeding, abdominal pain, and she expelled a three months' fetus and secundaries completely. The convalescence was uneventful, and she was discharged fifteen days after operation. The pathologic report showed a tubal pregnancy, fetus intact, follicular cysts of ovary.

The possibility of a combined pregnancy should be borne in mind especially in cases diagnosed as extrauterine pregnancy. At laparotomy for extrauterine pregnancy, both ovaries should be inspected, and the finding of two corpora lutea should raise the question of an associated intrauterine pregnancy. Care should be used in the handling of the pregnant uterus, and in the postoperative treatment, for a fair percentage of the cases go on to term, and deliver normally.

## TRAUMATIC RUPTURE OF THE LIVER AND KIDNEY WITH EVISCERATION, COMPLICATING PREGNANCY

W. F. GEMMILL, M.D., F.A.C.S., AND T. A. MARTIN, M.D., YORK, PA.  
(*From the York Hospital*)

THE following case report demonstrates the possibility of recovery even when multiple organs are traumatized and ruptured in the presence of a complicating pregnancy.

Mrs. G. B., aged twenty-six, was admitted to the York Hospital following an automobile accident, the chief symptoms being pain, bleeding, and moderate shock.

Examination of the case in the emergency room showed a large transverse, ragged wound about 8 inches in length in the upper right quadrant with the major portion of the intestines hanging out on the bed linen. In addition there was a large laceration across the upper and right lateral part of the liver extending down to the fossa of the gall bladder but with no injury to the gall bladder or associated structures. The major portion of the right lobe of the liver protruded from the wound and two pieces of the liver approximately 2 by 3 inches were lying loose in the abdomen. The handle of the car door was found loose in the abdomen surrounded by omentum.

Further examination showed a pregnant uterus of about seven months' duration.

On the left cheek was a punctured wound. On the right side of the face a laceration extended from the angle of the mouth to the hair margin of the frontal region, across the scalp to the right of the median line, and turning distally at the parietal eminence to end above the right ear.

The patient's pulse was 110 per minute and the blood pressure 85/46.

The patient was transferred to the operating room by carefully wrapping the entire body in a sheet in order to prevent further evisceration and trauma to the exposed abdominal organs.

The intestines were cleansed with normal salt solution and the operating table turned in the left lateral position, thus aiding in the reduction of the herniated viscera. There was no rupture of the intestines noted.

The bleeding was controlled by sutures approximating all of the numerous lacerations of the liver and one section of the right lobe weighing 300 gm., being held only by a small pedicle, was entirely removed. The raw liver edge was sutured with catgut.

The right kidney was torn transversely from its medial to its lateral border involving the capsule and the kidney parenchyma but not extending into the calices. The bleeding from the kidney was profuse but was readily controlled by placing several deep sutures through the capsule and kidney substance.

Drainage was established by placing two cigarette drains between the pregnant uterus and the right lateral abdominal wall, the distal ends protruding through a stab wound close to Poupart's ligament. Likewise two drains were placed through a stab wound in the loin for dependent drainage. Because of the tendency to ooze from the raw liver substance seven large cigarette drains were placed in the subhepatic space, circularly arranged so as to include a large gauze pack. The ends of the abdominal wound were closed by suture.

The x-ray examination of the skull did not demonstrate a fracture. The examination of the catheterized urine was *macroscopically clear but microscopically* a few red blood cells were seen. Frequent subsequent examinations of the urine demonstrated a few red blood cells until the thirteenth postoperative day.

A blood count showed red blood cells 3,500,000, white cells 7,200, hemoglobin 50 per cent (Dare).

On the third postoperative day the patient was delivered of a seven months' fetus. Otherwise her convalescence was uneventful and at no time did the temperature rise above 101° F. or the pulse rate exceed 130 beats per minute.

After forty-six days of hospitalization the patient was discharged being in good physical condition and the abdominal wounds healed.

135 EAST MARKET STREET.

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## AN INEXPENSIVE LIGHT FOR DELIVERY OR OPERATING ROOMS

W. C. DANFORTH, B.S., M.D., F.A.C.S., EVANSTON, ILL.

*(From the Department of Obstetrics and Gynecology, Northwestern University)*

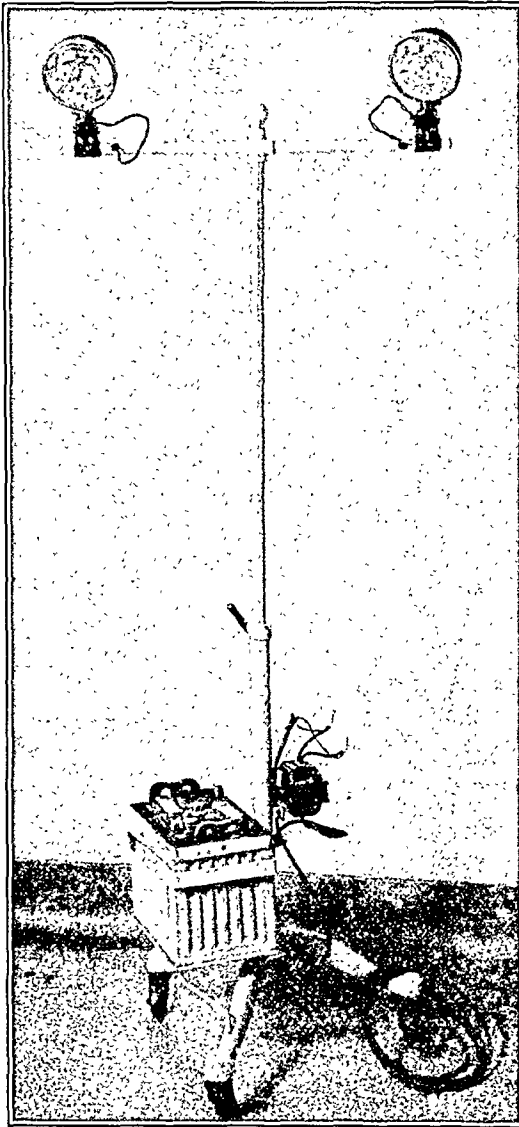
**I**N THESE days of financial stress, when all hospitals are finding it difficult to meet their operating expenses, the provision of new equipment becomes a problem. The staff dislikes to ask for anything which is not absolutely needed, and hospital administrative officers, who are usually anxious to provide all necessary equipment, in many cases, have all they can do to find funds for food, help, and fuel. Any suggestion which aids in meeting this problem, and which may at the same time make it possible to purchase new appliances, is of value.

Two lamps were recently made for two of the delivery rooms of the Evanston Hospital. The entire cost of materials for the construction of both of these lamps was \$19.00. No charge for labor is included. We are indebted to Mr. William Hendrey, chief engineer of the Hospital, for the ingenuity which resulted in their construction. The work was done by one of his engine room staff and most of the materials were parts of previously discarded pieces of equipment, supplemented by a small amount of gas piping. In addition to these items, there were required for each lamp two lamps such as are used for "spot lights" on automobiles, and which were obtained from a dealer in automobile supplies, a current converter to change the city current to one which could be used in lamps such as are described, a few feet of electric cord with a plug, and, for one of the two lamps, a small automobile storage battery to which the wiring might be attached in case of failure of the city current.

The spot lights are pivoted so that they may move in any direction. They may both be made to shine on the same spot, or they may be used singly. For illumination high in the birth canal the brilliant light which they afford is very useful.

The lamp carrying the emergency storage battery is shown in the illustration. This is carried on a simple rack made of flat strips of iron.

No complicated arrangement of switches is required. The wires from the current converter are joined to those of the cord leading through the center columns to the lamps by adhesive tape. Should the current fail, it requires but a moment to remove the tape and to attach the wires leading to the lamps to the battery.



(E. L. Ray, Evanston, Photographer.)

Fig. 1.—A simple and inexpensive lamp showing automobile storage battery, current converter, wires from which are joined to lamp wires by tape, and automobile spot lights.

For convenience in handling the lamp, the battery is usually removed and kept in an immediately accessible place near the delivery rooms. It must, of course, receive the care which such batteries require if it is to be of use when needed.

636 CHURCH STREET.

# EPILEPSY ASSOCIATED WITH OVARIAN DYSFUNCTION TREATED BY IRRADIATION

IRA I. KAPLAN, B.Sc., M.D., NEW YORK, N. Y.

*(From the Gynecological Service and the Radiation Therapy Department,  
Bellevue Hospital)*

SO OFTEN do we find it reported in the literature that irradiation has produced favorable results in cases failing to respond to the usual therapeutic procedures, that it has come to be a matter of course, when other means of alleviation fail, to treat such intractable cases with x-ray or radium therapy.

Recently Wieser in his review of the subject of epilepsy and radiation stated that irradiation is of benefit in traumatic, but of doubtful value in genuine epilepsy. On the other hand Witzleben reports that irradiation of the skull is a failure.

While functional uterine and ovarian disturbances are at times associated with cranial lesions, particularly when the pituitary is involved, epilepsy associated with metrorrhagia is rare. Jelliffe does not mention any connection between epilepsy and gynecologic conditions. Schon has stated that 50 per cent of epileptic seizures arise in puberty, and are aggravated during menstruation, the menopause, and sometimes during pregnancy. He believes that in all such cases disturbances of the endocrine system are present. According to Hirst, epilepsy is a rare complication of pregnancy, and patients subject to this disease are usually free from its manifestations during pregnancy, but become again subject to the attacks during the puerperium and with the reappearance of menstruation. No mention of it at all is found in the gynecologic works of Dudley or of Eden and Lockyer. In his study on menstruation in relation to mental disorders, Healy states that epilepsy may occur with the first menstrual period and appear regularly thereafter but ceasing with the menopause. Two such cases were cured by removal of the ovaries. Other gynecologists have observed that epilepsy is less marked after the menopause, and accordingly irradiation has been suggested for advancing the menopause, so that by suppressing the menstrual function the epilepsy would be controlled. MacKinnon reports a case of a young girl cured of epilepsy and an associated goiter condition by oophorectomy.

The case herewith reported presents an instance of metrorrhagia associated with epilepsy, which has apparently been cured over a period of five years, following suppression of the menses by x-ray therapy.

M. G., aged twenty-eight, single, was admitted to the Gynecological Service at Bellevue Hospital May 9, 1927, complaining of persistent vaginal bleeding for five weeks, weakness, epilepsy, and rheumatic pains. In 1923 she had a tonsillectomy for frequent sore throats. Following this operation she was treated at another hospital for thyroid toxicosis. In 1920, on account of severe dysmenorrhea, she went to still another hospital where a ventral fixation operation was done. During the year previous to present admittance, 1926, she had fits, biting her tongue, frothing at the mouth, and fainting spells. She was always constipated. The patient had been in Bellevue Hospital previously for treatment of epileptic fits and heart trouble.

The physical examination revealed no striking abnormalities. The patient was slightly nervous and there was appreciable bleeding from the uterus. The Wassermann was negative. High voltage x-rays to the pelvis was advised and during

the course of the treatment from May 27 to June 17, 1927, bleeding increased at first but later stopped entirely. The patient was very nervous and on June 8 had an epileptic fit while asleep. On July 8 she had another epileptic fit but no bleeding. August 29 she had a slight fit. On Oct. 3, 1927, she reported to the clinic in excellent health, had had no bleeding since June, 1927, and no "fits" since Aug. 29, 1927, had gained several pounds in weight, weighing then 108 pounds. She complained of occasional flushes and night sweats.

The patient was seen again in April, 1928, in excellent condition, had had two slight fits, Nov. 6, and 22, 1927.

In January, 1929, the patient was seen again and was in excellent condition, had had no menstruation since April, 1927, and no bleeding since June, 1927, however, had a slight epileptic attack in June, 1928. In January, 1929, she felt fine, weighed 125 pounds, had only occasional flushes.

On Sept. 4, 1929, patient was married and had a nose bleed the day following, probably a vicarious menstruation. However, because the menopausal symptoms persisted x-ray therapy to the pituitary was given in January and June, 1930, with some relief.

At present, July, 1932, the patient feels fine, has had no epileptic fits since June, 1928, no uterine bleeding since June, 1927, but complains of occasional flushes. Her present weight is 136 pounds and her general condition is excellent and she wishes at the present time to become pregnant.

I believe that epilepsy associated with metrorrhagia and dysmenorrhea and with some thyroid toxicosis may be controlled by the x-ray suppression of the menses.

55 EAST 86TH STREET.

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## OMPHALITIS OF THE NEWBORN\*

C. C. WEITZMAN, M.D., BROOKLYN, N. Y.

MRS. R. A., admitted to Williamsburgh Maternity Hospital on the evening of April 2, 1931, gave birth on the following morning to a female infant, weighing 11 pounds 8 ounces. The delivery was normal and spontaneous, and the baby at birth was a perfectly normal child. She was sent to the nursery in perfect condition, after the usual routine treatment. The eyes had been treated with a 1 per cent solution of silver nitrate, and the cord, which had been tied about  $\frac{1}{2}$  inch from the umbilicus, was dressed with a dry sterile dressing.

For the first three days the baby was normal in every respect, including respiration and temperature. Its weight remained stationary during this period.

On the fourth day the infant developed a temperature of 101° F. and exhibited marked jaundice. At the same time her respiration rose to 32 per minute. She was given a teaspoonful of castor oil and a colonic irrigation, and was taken off the breast and put on a formula.

On the fifth day the jaundice increased in severity, while the temperature went down to 100°. Colonic irrigations were given twice a day. Respiration and jaundice increased, however, although the stools continued to be of the normal yellow color.

On the following day the temperature was 102°; respiration had become 56 per minute, and the jaundice still more severe. A clysis of 40 c.c. saline solution

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\*Read before Beth Moses Hospital Clinical Society, April 21, 1932.



was accordingly given. The lungs were found negative. The increased respirations and the intense jaundice could not be accounted for. The stools continued to be yellow, and were never of the clay color characteristic of obstructive jaundice.

On the seventh day the temperature reached 104°; respiration was 60 per minute, and jaundice had increased still further. Another clysis of saline solution was given, and also a colonic irrigation.

On the eighth day the temperature was still 104°; the intense jaundice and rapid respiration showed no abatement but, on the contrary, exhibited a still further exacerbation, and the infant died on this day.

At autopsy a dense infiltration of polynuclears and mononuclears was observed about the umbilical vein, extending its entire length. The liver was increased to about three times its normal size, and was of soft consistency. All the organs of the body were in a condition of marked jaundice, the presence of bile being observed everywhere.

Microscopic examination of the liver revealed the presence of an infectious hepatitis throughout. Death was due to infection from the umbilicus, notwithstanding the perfectly normal appearance of the navel to the naked eye.

During the entire eight days of this infant's life, there had been no sign of abnormality in the lungs nor any indication of infection around the umbilicus. The only irregular signs were the marked jaundice, the increased respiration and the toxemia.

847 EASTERN PARKWAY.

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## A DEVICE FOR THE CORRECTION OF POSTPARTUM UTERINE ATONY

EMERSON L. STONE, M.D., NEW HAVEN, CONN.

**M**ASSAGE or manual compression of the freshly delivered uterus for the control of atony and bleeding is not always easy or effective. Excessive thickness of the abdominal wall or spasm of the muscles often renders the fundus uteri inaccessible. The attending physician is often preoccupied with the resuscitation of the infant, examination of the birth canal, or with surgical work on the perineum, while the necessity for massaging the uterus may interrupt prematurely his aseptic routine. The commonest causes of failure in the hands of nursing assistants include (1) faulty instruction in the technic of the maneuver and inadequate realization of its significance, (2) insufficient strength to maintain the necessary degree and duration of pressure, (3) a tendency to relax the effort out of sympathy with the patient's objections, and (4) inability to evaluate properly the abdominal and vaginal signs which determine the success of the treatment.

Artificial devices for the maintenance of pressure often fall short of maximum efficiency. Ordinary abdominal binders neither exert any effective force upon the freshly delivered uterus, nor can they be securely maintained in place.

In order to achieve consistent and dependable uterine stimulation, a girdle has been devised consisting of two plates of light canvas joined on each side by four parallel straps with adjusting buckles. After delivery of the placenta, the plates are adjusted to the abdomen and back. A pile of folded towels is placed beneath the upper plate just above the contracted uterus, and the girdle is snugly tightened, forcing the barrier of towels down behind the uterus, not over it. The abdomen is so compressed in its upper half or two-thirds that it is impossible for the uterus to rise up and bleed. Compression of the aorta may be a contributing factor but is probably of less importance.

The immediate benefits of the procedure are (1) the uterus is made firm, uniformly, promptly, and continuously, (2) it is comfortable to the patient since the pressure is distributed over a broad area, (3) it makes massage unnecessary and permits the attendants to perform other essential duties, (4) if inspection of the cervix is necessary, it is already rendered accessible without extra pressure or traction, and (5) if tamponade is required, the packing is accomplished more easily and with less material, against the firm resistance of the secured uterus. By means of a T-binder attached to the abdominal girdle, the pressure of the vaginal tampon can be maintained snugly. The girdle is generally removed in four to eight hours, preferably by a graduated release of pressure.

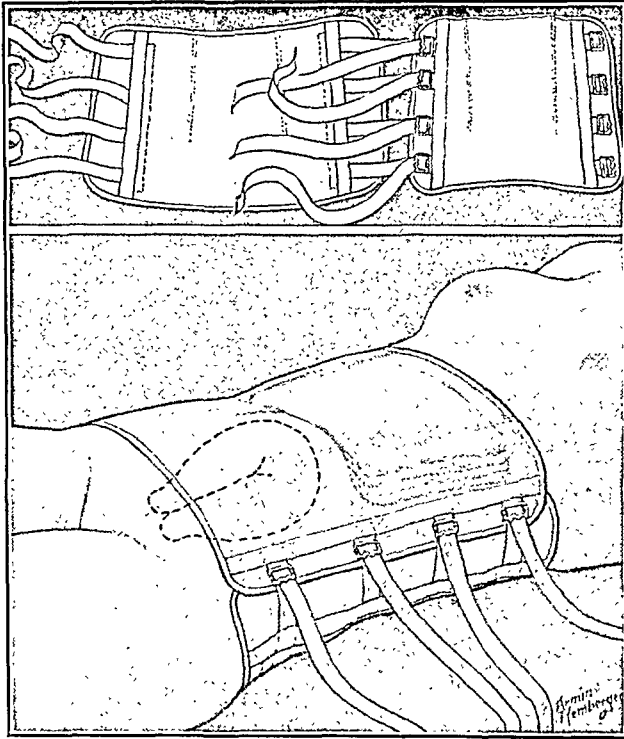


Fig. 1.

The garment is particularly designed for those patients who bleed too freely from atony, or those in which the uterus tends to relax abnormally regardless of the degree of hemorrhage. In its use over an extended period, there has been a uniformly prompt and persistent contraction; no serious hemorrhage has occurred, early or late; and no direct or indirect evidence of trauma or other complication has arisen. The device is light but strong and durable. It is adaptable with equal effect to patients of differing size and contour. It is washable, portable, and hence adapted to both hospital and outside practice.

The Spencer Corset Company of New Haven has kindly made up the garments according to specifications and has rendered every courtesy in helping to evolve this adjunct to our therapeutic equipment.

## A CASE OF ACUTE FIBROID DEGENERATION WITH COMPLETE TORSION OF THE UTERUS

ABRAHAM J. FLEISCHER, M.D., AND J. IRVING KUSHNER, M.D.,  
NEW YORK, N. Y.

*(From the Department of Obstetrics, The Bronx Hospital)*

MRS. I. B., aged forty-five, admitted to The Bronx Hospital because of vaginal bleeding, lower abdominal pain, nausea, and temperature of 101°. Family history irrelevant. Past history revealed a similar attack four years ago diagnosed as appendicitis and treated conservatively. Menstrual periods began at the age of eleven, of the twenty-eight day type with six day flow. No pain. No leucorrhea. Always regular. Para i, gravida i. For the past year periods have increased in length and have been associated with the frequent passage of clots. Present illness began two days before admission in an intermenstrual period, with nausea, abdominal pain and bleeding. Temperature continued to rise, medication gave no relief.

Examination showed an obese, middle-aged female, acutely ill. No jaundice or cyanosis. No dyspnea. Temperature 102.5°, pulse 112, regular and of good quality. Respirations 26. Heart and lungs were negative. Blood pressure 140/90. The lower abdomen was filled with a firm, irregular, nodular mass slightly tender. On vaginal examination this mass was felt as distinct from the uterus. A diagnosis of twisted ovarian cyst or twisted fibroid was made and she was removed to the hospital for operation.

Under spinal anesthesia, a mid-line incision was made below the umbilicus, revealing a large fibroid which together with the uterus filled the true pelvis and extended to the right lower quadrant of the abdomen. The uterus was twisted upon its long axis so that the right tube and ovary lay posteriorly and to the left. The left ovary contained a simple parovarian cyst, and was situated anterior and to the right. A supravaginal hysterectomy, bilateral salpingo-oophorectomy and appendicectomy were done. The postoperative diagnosis was degenerating fibroid of the uterus producing torsion and a simple parovarian cyst. The uterus was approximately 16 by 15 cm. The left ovary was atrophic and the seat of a parovarian cyst 4 by 5 cm. and containing a clear serous fluid. The entire posterior and right lateral walls of the uterus were occupied by a firm fleshy mass showing here and there areas of hemorrhagic softening and cystic degenerations. The entire uterine cavity was reduced to a small slit-like opening which was pushed to the left and upwards, and ran in a spiral direction. The right ovary contained one large lutein cyst. The tubes appeared to be normal. Sections showed a leiomyofibroma with areas of anemic autoinfarction and hyalinization.

Patient made a fair recovery, the postoperative course being complicated by a right upper bronchopneumonia. She was discharged, well, on the nineteenth postoperative day.

This history demonstrates that extreme torsions of the uterus must be considered in the diagnosis of pelvic disease, particularly when fibroid degeneration has taken place, presenting similar findings on bimanual examination to that of a twisted ovarian cyst.

1882 GRAND CONCOURSE.  
215 EAST GUNHILL ROAD.

# Society Transactions

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## NEW YORK OBSTETRICAL SOCIETY

*MEETING OF FEBRUARY 14, 1933*

DR. EDW. L. KEYES read, by invitation, a communication entitled **The Importance of Establishing a Conditional Reflex "Pregnancy—Syphilis" in the Minds of the Medical Profession.** (See page 71.)

DR. ARTHUR STEIN read, by invitation, a paper on **The Relationship Between Gynecology and Orthopedics.** (See page 64.)

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## CHICAGO GYNECOLOGICAL SOCIETY

*MEETING OF FEBRUARY 17, 1933*

DR. SOL. LITT read a paper on **Autotransplantation of Placenta to the Anterior Chamber of the Eye and Its Effect on Lactation.** (See page 37.)

DR. R. A. LIFVENDAHL read a paper entitled **Hematometra Cervicalis with Special Reference to Pelvic Endometriosis.** (Will be published in August issue.)

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**Pastiels: Severe Eclampsia Treated by Supra-pubic Cesarean Section After Failure of Delmas' Method, Bruxelles-med. 10: 493, 1930.**

Pastiels feels that where medical treatment of eclampsia has failed to check the progress of the disease, evacuation of the uterus is indicated. The two procedures of choice are (1) Manual dilatation of the cervix under spinal anesthesia according to the technic of Delmas or (2) supra-pubic cesarean section.

He reports in detail a case where failing manual dilatation of the cervix a low cesarean section was done with excellent results. He points out that one reason for failure of the first method was muscular constriction of the internal os due possibly to an isolated muscular irritation by the toxins of the eclamptic state, and cites a somewhat similar case reported by Coll de Carrera and Bremond in which spinal anesthesia failed to obtain a paralyzing effect on the cervical musculature. This latter author further feels that in eclamptic states it is always more difficult to obtain cervical dilatation under spinal anesthesia.

THEO. W. ADAMS.

# Special Article

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## THE DEVELOPMENT OF MARRIAGE CONSULTATION CENTERS AS A NEW FIELD OF SOCIAL MEDICINE

MARIE E. KOPP, PH.D., NEW YORK, N. Y.

### THE ORIGIN AND HISTORY OF THE MOVEMENT

MARRIAGE consultation centers in Germany and Austria, more than one thousand in number, are chiefly a postwar development. Although operating under a variety of names,\* they have the common purpose of directing public opinion toward the betterment of national health in relation to the family.

The groundwork for the growth of these centers can be discerned in the activities of certain lay groups. The Society for the Protection of Motherhood and Sex Reform started its work as early as 1905, under the able leadership of Helene Stöcker. In 1908, a group in Dresden interested in race improvement and race hygiene recommended the compulsory exchange of health certificates before issuance of the marriage license.

Certain conditions which resulted from the war, or became manifest after it, precipitated the development of consultation centers in Germany and Austria.

1. The loss of men in the age groups of twenty to fifty during the world war left a considerable number of women without an opportunity to found a family.

2. The economic situation and shortage of dwellings emphasized still other factors.

3. The increase in divorces from 14.1 for 100,000 inhabitants in 1900, to 56.8 in 1925, that is, equal to four times the ratio of 1900.<sup>1</sup>

4. An increased distribution of a large amount of literature on sex questions is still another factor.

Side by side with these loosely related social problems was the desire of the state to rebuild the nation's health.

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*Editor's Note.*—The article by Miss Kopp may seem foreign to the scope of this Journal. However, the medical profession has been made to realize, perhaps too slowly, that there are allied fields with which its contacts have not always been sufficiently close. The study of marriage justly may be regarded as one in which the doctor assumes a responsibility and should manifest an interest equal to that of the sociologist, the psychologist, the lawyer, and the clergyman. Europe has already acknowledged the value and desirability of establishing consultation centers and Miss Kopp has recently completed a personal survey of the clinics in German speaking countries and organizations with the cooperation and support of the Oberlander Foundation. We take pleasure in presenting this report to the readers of the Journal and believe it will be of interest and value to those who have possibly considered the desirability of developing such activities in this country. A similar survey of the American situation will probably be undertaken in the future by the same author.

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\*The names Marital Consultation Centers, (Eheberatungsstellen), Consultation Bureau on Sex Hygiene (Sexualberatungsstellen), Prenatal and Postnatal Clinics (Schwangerschaftsberatungsstellen), and Birth Control Clinics (Beratungsstellen für Geburtenregelung) cover a variety of services pertaining to motherhood.

The Berlin Race Hygiene Society, now the Eugenics Association, and some medical groups, renewed in 1916, and 1917, earlier discussions concerning the advisability of compulsory medical examinations as a basis for an exchange of marriage health certificates before the issuance of a license. It was felt, however, that education on the responsibility of each human being to pass on a healthy mind and body must precede legislative measures.

At their instigation, the National Government decreed that a circular be handed to all applicants for marriage licenses, calling attention to the importance of physical and mental health to a happy marriage and healthy offspring. Valuable as this procedure might have proved it scarcely could be made effective at so inopportune a time as two weeks prior to marriage, but it served a useful purpose in centering public attention on the fact that only the healthy should propagate.

With the extension of the impersonal sickness insurance in Germany and Austria people found it more difficult to discuss their personal problems than had been possible when a family physician was available, yet many individuals who received medical care through sickness insurance, or specialist's services, aroused by the publicity given the idea of compulsory exchange of health certificates, were eager for information and guidance respecting their own chances for healthy offspring. Hence the need for some new form of service among people, who are without a family physician, proved to be another important element contributing to the establishment of consultation bureaus in various parts of the country.

The chief driving power back of all these efforts were the scientists at the various universities, who had been quietly active in the classroom, through their writings and on the public platform. Each in his own special field made it known that race hygiene and race betterment are the natural concern of everyone. This educational leadership emanated from such men in biology and genetics as: Eugene Fischer, Muckermann, von Verschuer, Lenz and others; from such men in psychiatry as Rüddin, Hübner, Lange, Gerlach and Häberlin, from gynecologists such as Sellheim, Paul Strassmann, Max Hirsch, Flaskamp and Niedermeyer, and in the field of public health, such men as Grotjahn, Tandler, Thiele, Poll, Ostermann, von Drigalski, Fetscher and Iapha. Rüddin, Hübner, Gerlach, Häberlin, Muckermann and Lenz, have been actively engaged for years in advising students and other applicants on eugenic problems. The education of public opinion by leading university men, has been a sustained effort for the last thirty years.

#### ESTABLISHMENT OF CONSULTATION CENTERS UNDER MUNICIPAL AND PRIVATE AUSPICES

In 1919, the Berlin Institute for the Study of Sex<sup>2</sup> (Institut für Sexualwissenschaften), a privately supported organization at first, but now a Government institution, interested in the study of sex, opened a consultation center for advice and guidance on sex problems. In 1923, a marriage consultation center was opened in Dortmund as a privately supported enterprise, and Dresden followed suit in 1923. The Society for the Protection of Motherhood opened a number of centers in 1924, in Frankfurt-am-Main, Mannheim, Breslau, Berlin.

The first matrimonial health consultation center for marriage candidates was opened in Vienna in 1922, under public control. This experiment was part of the social medical welfare work of the Municipal Board of Health. Its main objective was the ultimate improvement of national health.

In 1926, the Prussian Social Welfare Ministry recommended the establishment of municipal centers for giving premarital advice. The chief aim was the furtherance of race hygiene and race improvement, understood mainly to be an educational measure to enlighten voluntary applicants regarding heredity and eugenics, and to awaken them to their responsibilities to the next generation.

As a result, the first official advice bureau was opened that year. This bureau, located in the thickly populated district of Prenzlauerberg-Berlin<sup>3</sup> was organized as a consultation center on all problems relating to the health and social welfare of the family. By Jan. 1, 1931, some 200 centers had been established in Prussia.<sup>4</sup>

In 1927, the Saxon-Thüringen Ministry of Labor and Social Welfare<sup>5</sup> recommended the establishment of marriage advice centers as part of the social welfare work of the State. This was an official recognition of the work of the advice bureau, conducted in Dresden under private auspices since 1923. In 1928, the Ministry of the Interior of the Free State of Braunschweig also took official action and recommended the establishment of marriage advice centers with functions and scope similar to the Prussian pattern. At this point, an added impetus was given to the development of marriage advice stations by a newly enacted law on the treatment and handling of venereal diseases. This law of 1928 provided that all persons suffering from syphilis, gonorrhea, and chancre must undergo treatment by a licensed physician, and that disobedience and negligence in following instructions is punishable under the law.

In Switzerland, Zürich established an official marriage consultation center in 1929, dividing the work into advice on problems arising before marriage, during marriage, or, in relation to child guidance and education. Basle opened an official advice bureau in January, 1933, as part of the City's Welfare and Public Health Work.

Departments of Health of many smaller cities cooperate with the local insurance organizations in marriage advice centers, as in Dresden, Lübeck, Hamburg, Linz, and other cities. The Union of the Sickness Insurance Organizations of Berlin (*Verband der Berlin Ortskrankenkassen*), for example, has organized seven centers, which are distributed throughout the city. The National Association of the "Krankenkassen" established the services upon amendment of by-laws in 1927, permitting the dispensation of contraceptive articles to policy holders. This measure was taken to reduce the heavy expense incurred by insurance organizations through a large number of sick leaves resulting from the spread in the practice of abortion. An abortion cost the Berlin Sickness Insurance Organization (*Ortskrankenkassen von Berlin*) from 50 to 70 Reichsmarks<sup>6</sup> without taking into account cost for treatment for pelvic disorders resulting from abortifacient practices. Sickness insurance is obligatory in Germany, Austria, and Switzerland for workers in industries and trades paying wages below a certain income level.

In addition to the municipal marriage consultation centers, and the centers maintained by the sickness insurance organizations, there are about one thousand marriage consultation centers, privately supported through membership. Some of these organizations have traveling outfits (*Fliegende Beratungstellen*) which move from place to place at regular intervals. These are manned by a physician and an employe, called a "Funktionär," an individual without social or scientific training. They extend the services of the organization to members residing in outlying districts. The best known of these organizations is the Society for the Protection of Motherhood and Sex Reform (*Bund für Mutterschutz und Sexualreform*). Since its inception in 1905, the organization has gradually expanded its work by establishing consultation centers in most of the larger cities. It has over 100 such affiliated centers today. Physicians are in charge in the larger cities, as in Berlin,<sup>7</sup> Frankfurt-am-Main, Hamburg, while in all other centers social workers are advising and redirecting applicants to the various services for treatment. Two of the Berlin centers, and the Frankfurt center, are a joint venture of the official consultation center. The League for the Protection of Motherhood and Family Social Hygiene (*Liga für Mutterschutz und Soziale Familienhygiene*) with a membership of about 27,000 has over 500 birth control centers. Only three are under the direction of a physician. Some of these places have worked out arrangements with some

local physician, who agrees to give consultation and advice on personal problems and sex hygiene, but the majority of stations are advice centers, where laymen are advising on birth control measures, furnishing certain articles direct, or, where the method requires prescription and instruction, referring the applicant to a physician. The National Organization for Birth Control and Sex Hygiene (Reichsverband für Geburtenregelung und Sexualhygiene) with a membership of 20,000 is the largest organization of its kind. It has over 230 affiliated local groups, each with a consultation center. Chief emphasis is put on birth control advice, as implied by the name of the organization. Physicians are in charge of the centers of Berlin, Hamburg, and Nürnberg. The Association for Limiting the Size of the Family (Verband für die Kleinhaltung der Familie), with some 12,000 members is also chiefly interested in birth control advice and sex hygiene. Aside from these larger organizations mentioned are a number of smaller groups with similar aims. The total membership of these lay groups was said to be 113,000 at the end of 1931, and it is to a large extent recruited from among the working classes. The organizations are based on a cooperative plan, supported by yearly membership dues ranging from three to eight Reichsmarks (equal to 75 cents to \$2.00) which provides for free treatment, that is, prescription of method, and distribution of materials at wholesale price, and a monthly magazine on Social Hygiene and Sex Education. The advice centers of the Bund für Mutterschutz, however, receive regular subsidies from the various city governments in recognition of the work done in the community.

There are no restrictive laws in Germany, Switzerland, and Austria, prohibiting the manufacture, transportation and distribution of contraceptive articles, but regulations governing the sale of articles recognized by the medical profession to be injurious are strictly enforced. These lay groups were organized for the protection of the public from commercial exploitation by manufacturers. They were instrumental in enlisting the cooperation of physicians in the campaign to protect women from using harmful methods, and education in sex hygiene.

A large number of marriage advice centers are run under the auspices of national, or local women's organizations, that is, by some political groups, but the majority are run as part of the social work of various church groups. The advice bureaus conducted under these auspices emphasize the philosophic, ethical, and religious adjustment to the marriage union, the legal protection of the wife and children, and the practical angles of housekeeping and budgeting. Recognizing that the lack of care of children and of the home, is the cause of a great deal of domestic maladjustment, they are inducing the women to take courses in cooking, sewing, mending, nursing so as to remove causes of friction. This method of solving matrimonial difficulties is particularly well organized in the Roman Catholic centers.

Most of these centers were established in 1931 and 1932. They were not intended to duplicate the work of the municipal marriage advice centers, but rather to supplement such work with the spiritual and educational advice. There is close cooperation among the women's organizations affiliated with the social work of the church groups.

In Freiburg im Breisgau, for instance, where the medical marriage advice bureau is located, in the Women's Hospital, part of the University, advice to both Roman Catholic and Protestant patients is given by the same physician, but at different sessions, so as to afford the spiritual advisers the opportunity to carry out their part of the mission.

The women's organizations under the auspices of the Roman Catholic Church have 50 centers distributed all over Germany; those under the auspices of the Protestant churches 13, and the Jewish Women's organizations have only two centers, one in Berlin, and one in Frankfurt-am-Main.



Applicants to almost all of these religious centers are redirected for professional service to physicians, lawyers, or other social welfare centers.

The advice bureaus, which deal with legal questions relating to the marriage union, are primarily sponsored by the national or local women's organizations, or legal aid societies. The scope of these bureaus also covers two periods when legal advice is desirable, or needed. First, premarital advice, which covers all legal steps needed to protect the woman's rights of property, and possibly the drawing up of a marriage contract. Second, advice to the married applicants, which naturally refers mostly to economic difficulties and divorce, and the possible, or probable court decision in each case in regard to grounds of complaint, custody of issue, and support of dependents.

In 1926, a group of people interested in the spread of information on legal questions and laws regarding real and personal property (the Verein der Freunde des Rechtsauskunft und Güteswesen), in Hamburg, opened an advice center for the engaged and married couples. Berlin, Dresden, Heidelberg, Breslau, Bochum, Munich, and Hanover, have well-established legal marriage advice centers, and in addition to these are a number of centers sponsored by religious groups, consultation sessions as a rule, run simultaneously with the medical consultation. Legal advice on marriage questions is also given at the official legal aid center of each community.

#### ADMINISTRATION, FUNCTION, AND GROWTH OF THE CENTERS

In the experiences of the official marriage advice bureaus in Vienna, Dresden, and Berlin, however, it was readily demonstrated from the very start by the problems for which the applicants sought advice, that premarital advice in the spirit of the Governmental decrees was too limited in scope to meet the need in the community. Husbands and wives, who had encountered difficulties in family adjustment were the most frequent visitors, which brought about a definite shift in the purpose for which the centers were established. Applicants fell into three main categories:

1. Candidates for premarital advice.
2. Men and women seeking advice on problems in the existing marriage.
3. Men and women in and out of wedlock, who want guidance and advice on sex and other personal problems.

The German idea of medical premarital advice is based primarily on the idea of mental and physical fitness of the candidates for marriage, and of their fitness to pass on a healthy mind and body to their children. One important part of the function of the advice centers is the medical certification on the fitness for marriage of minors. In some sections of Germany and Austria, the procedure is compulsory, and in many it is a customary function of the guardianship of minors to secure a medical certification before issuing a marriage permit. Such advice would be based on medical examination on the case history of the candidate, and on the case histories of the direct and collateral lines of their blood kin so far as it was possible to get information. This is in marked contrast to the American concept of marriage advice, which as a development of preventive medicine, focuses its attention on the more immediate need of the couple, that is, advice in, and guidance on, problems of conjugal adjustment.

Advice services provide at present consultations in all domains of medicine, social hygiene, psychology, biology, heredity, eugenics, and child guidance. Leaders in marriage advice work are agreed that these centers should be for consultation, not treatment. Accordingly an important feature of their work is the referring of applicants elsewhere for whatever special service may be needed to remedy psychic

or somatic ills. Social welfare agencies of the municipality and the Ortskrankenkassen are the main treatment centers. Similarly many centers, which do not give contraceptive instruction, refer applicants in need of such service. This practice is followed by the marriage consultation centers of Vienna, Dresden, Frankfurt-am-Main, Berlin-Prenzlauerberg, and elsewhere. On the other hand, a very large proportion of marriage advice bureaus do give contraceptive instruction to their clients. In still others, notably in some municipal centers, the direct giving of such instruction has been left by the Government entirely to the discretion of the counselors in charge of each center. All consultation centers, which are conducted under the auspices of national or local women's organizations limit their functions to consultation and advice, and possibly relief measures.

In some centers the scope is extended to include legal and economic problems, as well as questions relating to child health and adult and child education. Thus it is evident that the term marital advice has widely varying connotations.

The consultation service in Germany, Austria, and Switzerland, is designed to help the class of people with small incomes, who cannot afford physicians' and lawyers' fees, to discuss personal and family problems. Naturally, the more intelligent of the underprivileged are the ones who voluntarily make use of such service. In Vienna and Dresden, the domestic relations and children's courts often direct their clients to make use of the service. In Lübeck the municipal welfare exchange automatically refers its charges to the consultation center.

Recommendation from person to person represents the main source of applicants. In addition these advice centers are brought to the public notice through a variety of channels. Most of the official stations display posters in hospitals, at the marriage license offices, at Ortskrankenkassen, in the Government welfare stations, churches, railway stations, and other public places describing the consultation centers and their functions. Posters are conspicuously placed all over Berlin and in other cities.

The German Ministry of Health's circular on social hygiene and race improvement is distributed in all marriage license offices. Particularly successful educational work on all marriage questions is carried forward under the auspices of a large variety of medical or legal educational groups. Talks over the radio and press publicity keep the activities before the public. The cooperative organizations on birth control, education and enlightenment on sex matters have well organized publicity channels by means of monthly evening lectures on hygiene and related subjects (ordinarily given by a physician) and a magazine supplying reading matter and plenty of advertising. The circulation of some of these magazines is very considerable, and in some cases far exceeds the membership list. The *Liebe und Leben* has a circulation of 60,000, the *Wackruf* 30,000, and the *Sexual-hygiene* 21,000 copies. Members of the political and religious groups are reached by means of pamphlets, circulars and posters at meeting places. The various churches use pulpit, press and platform as a means of attracting applicants to the marriage advice centers.

The centers are usually located in the densely populated sections of the cities accessible to the various transit lines. They are usually housed in the offices of the Public School physician, municipal buildings, or in Ortskrankenkassen. In all cases, offices are located in a secluded section of the building, where privacy is ensured, and the applicant protected from the curiosity of outsiders.

The staff consists of a consulting physician, a medical social worker, and sometimes in addition, a volunteer medical social worker to follow up cases. Most of the centers hold two or three weekly sessions; one in the early afternoon, in order to give the housewife a chance to come at a time when she can best leave home

unobserved. The average number of visitors at a single session is six in the large consultation centers. Consultation, however, often takes place by appointment outside of the regular office hours to suit the applicant's time and need.

The reception of applicants differs from place to place. In most of the municipal advice centers, the applicant is first interviewed by the medical social worker, who takes down the social history and makes a social investigation.

To facilitate the interchange of information, the applicant is asked to sign a statement releasing the physicians, or hospitals, or lawyers, from obligation of professional secrecy in regard to information on previous treatments. Such information, however, may be used only by the staff members of the center consulted. It is customary as it would be in private practice, or in social welfare work, for the marriage counselor to confer with the person in charge of the service to which the patient has been redirected. This person in turn sends a written report to the advice center on the type of treatment given. These reports, which are filed at the marriage consultation center, constitute an automatic check on whether the applicant actually sought the treatment recommended. Practically all the centers report that instructions frequently are not followed. Serious as this situation is recognized to be, leaders in the marriage consultation movement realize that pioneer work such as this must in its experimental phase develop its technic slowly. It is not altogether surprising, therefore, to learn that applicants who fail to follow the advice given, receive merely a polite note reminding them that the suggested procedure is for his, or his family's own good.

A problem of outstanding importance in the development of marriage advice service is the finding of counselors who have the requisite qualifications for the task. In this field particularly the personality and the human qualities receive foremost consideration for the task. Sympathy, insight and tact are regarded as a *sine qua non*. Next in importance obviously, are technical and professional training coupled with experience. Candidates for the marital advice centers, which operate under Government auspices, and in this instance the Krankenkassen would be included under that designation, must be licensed physicians and with university training in economics and sociology, who have been engaged for a few years at least in private practice, and who have had at least academic knowledge of public health, maternal health, endocrinology, psychology, psychotherapy, child guidance, and eugenics. They must be familiar also with the policies employed for promoting personal hygiene in the interests of the health of the nation. As stated elsewhere, the privately supported advice centers frequently are not called upon to give other than contraceptive advice. In the majority of cases this is accomplished by referring the applicants to some physician in the community. As a rule only in the larger cities is the center under the direction of a physician. In the vast majority of smaller centers a trained social worker is in charge.

The counselors for the most part are men and women in age groups between thirty and forty-five. The general feeling is that those above or below these limits are undesirable, because of little experience on the one hand, or of being out of touch with new ideas on the other hand. While most of the counselors in Germany and Austria are married, that feature is not especially stressed. Neither is happiness or unhappiness in marriage a determining factor in the selection of counselors. An exception in the general attitude is that of the church groups, where the work consists largely of redirecting applicants. In the Catholic centers it is felt that a married woman, not necessarily a physician, who has shown her community that she is able to handle her family life successfully, is well adapted to the services required. In Protestant centers such services are rendered frequently by wives or widows of the clergy.

One other factor widely discussed by those interested in the development of marriage advice work is the desirability of choosing as counselors physicians interested in public health and general medicine, rather than specialists in any particular domain of medicine. It is held that certain specialists should not be considered as counselors, not only because of the danger of overemphasis of the particular specialty, but for a variety of other reasons. The urologist is not regarded as a happy choice, because of the fear of so many people that they might be suspected by others of having venereal disease. The choice of a gynecologist or obstetrician is not viewed with favor because the centers wish to limit their service to consultation and advice, a task considered more difficult in these specialties where the patients recognizing the close relationship between the technic of examination and treatment expect to receive treatment also. An added objection arises because the nature of the specialty naturally leads to an expectation that birth control instruction may be readily obtained. Hence the broader purpose of giving marital advice on any problem may, it is feared, narrow to the giving of contraceptive advice only. Still other considerations render the psychiatrist or tuberculosis specialist a less desirable choice. Some authorities have called attention to the danger not only of letting hereditary factors overrule human considerations, but of inducing a hypochondriacal condition by overemphasis of the individual's potentialities for hereditary taints.

In most centers, a medical social worker assists the counselors in the reception of applicants, and in effecting the necessary contacts with the community's social and medical agencies. Her schooling consists of specialized training in one of the various fields of social welfare work, that is, graduate in either nursing, teaching, kindergarten, or domestic science. To this specialized training must be added two years in a school of social service, where she is instructed in the academic and practical side of social welfare work. In addition to the regular staff, the services of volunteers are employed in making contacts and for special follow up.

The cost of maintaining consultation centers in Germany and Austria is defrayed from various sources: taxation, subsidies, insurance, membership dues, church and party funds. No fee is charged in any of the centers. In the municipal centers, supplies sometimes are furnished free of charge. The cooperative centers furnish birth control supplies at cost. As mentioned elsewhere, the Krankenkassen since 1927 have permitted the dispensation of contraceptive articles to policy holders.

The municipal centers are supported from public funds. Centers at the Krankenkassen derive their support from insurance funds maintained jointly by employer, worker, and the national and state governments. The private cooperative centers are supported from yearly membership fees. One of these, the Bund für Mutterschutz, receives regular subsidies from the municipalities. In some cities this organization supplements the work carried on by the municipality by furnishing supplies or special services. Churches and political welfare groups defray the cost of their centers from organization funds.

The chief items of expenditures are salaries, rent, equipment, and in some cases supplies. In the cooperative, religious and political centers, the medical and legal counselors volunteer their services. These centers and the Krankenkassen provide their own quarters. In the centers maintained by the municipality, the rent for office quarters does not involve extra expense as the centers generally use the public health examination places in schoolhouses or municipal buildings. In many instances the offices of the Krankenkassen are put at the disposal of the city for marriage advice centers. The only expenses therefore incurred by the community are the items for printing and sundries.

Charges for service to applicants, who are able to pay, are being discussed as a measure to raise funds for the financing of special research, but so far no action has been taken in any one of the centers. The desirability of such studies is evident, for until the results of efforts along these lines have been analyzed we are without proper means of evaluating them.

The community usefulness and need of the marriage consultation centers are best demonstrated by the number of applications for service in some of the larger centers. The Vienna centers established in 1922, have an average yearly intake of somewhat less than 500 cases<sup>8</sup> and an equal number of revisits of former applicants.<sup>8</sup> The Dresden center<sup>9</sup> established in 1926, as a cooperative enterprise between the Ortskrankenkassen and the State show a steady increase of new cases from 111 in the first year to 1285 in 1932, plus revisits, which are not numerically recorded by this center. The Berlin-Prenzlauerberg<sup>10</sup> averages about 300 new cases, the revisits amounting to about 150 yearly. In Hamburg<sup>11</sup> the municipal marriage advice center (Vertrauensstelle für Verlobte und Eheleute) registered yearly about 250 applicants since its opening in 1926, and it averages somewhat less than 400 revisits per year.

The seven centers of the Berlin Ortskrankenkassen<sup>12</sup> took care of 2455 new cases in 1928, the year of opening the marriage advice center, and listed 3576 revisits. For the year of 1931,<sup>13</sup> 5630 cases were advised and the revisits of former applicants amounted to 14,548 consultations. Naturally a considerable number of applicants, who consulted the municipal centers are registered with the Ortskrankenkassen for treatment. The marriage advice center of Frankfurt-am-Main,<sup>14</sup> a joint venture of municipality and the Bund für Mutterschutz advised 7665 cases since 1925. Centers like Lübeck<sup>15</sup> Mannheim, Chemnitz, Breslau have registered about 150 cases per year and are now up to approximately 200 and some over. Unfortunately, the number of cases in the various centers of the Bund für Mutterschutz<sup>16</sup> are not tabulated, as yet, but the Berlin centers would indicate a caseload of about 300 a year, for the larger cities. Birth control advice is given in these centers, which partly explains the large caseload. The municipal marriage consultation<sup>17</sup> center of Berlin-Reinickendorf in 1929, had 280 applicants in its first year under new management. In 1930, there were 221 new applicants and 712 revisits. In 1931, there were 181 new cases and 580 revisits, and for 1932, new applicants amounted to 148, and there were 372 revisits.

The foregoing figures are quoted not so much to demonstrate the growth of the center, but more to show the actual demand of service given in the center. Women far outnumber the men in most of the centers; the opposite is found only in the age group of the younger applicants. In the centers under the auspices of the Roman Catholic Welfare groups, it is said that there are more men than women; no corroborating data have yet been published. Single and married men and women are treated on an equal basis in regard to the type of advice needed.

Reports on the analysis of the intake in the various marriage consultation centers give a fair picture of the type of applications. Because we do not know their numerical strength, the proportion of cases, however, is misleading owing to the fact that the total number of applicants is not recorded.

Premarital advice was sought in 1927, 1928, in some of the large centers by the following proportion of the applicants of the center:<sup>18</sup> Berlin-Prenzlauerberg 66 per cent, Dresden 45 per cent, Berlin-Neukölln 35 per cent, Mannheim 19 per cent, Berlin-Reinickendorf 16 per cent, Kiel 11 per cent, Berlin Friedrichshain 11 per cent, and Chemnitz 4.5 per cent.

Marriage consultation, meaning in this relation control of conception, certification for therapeutic abortion, sterilization and problems of sterility and all other prob-

lems of conjugal adjustment. The largest centers show that marriage advice in the above mentioned categories was sought in 1928, in Berlin-Kreuzberg by 86 per cent, the Ortskrankenkassen Berlin by 72 per cent, in Lübeck by 64 per cent, and in Berlin-Friedrichshain by 61 per cent and in Kiel by 57 per cent, while Berlin-Prenzlauerberg had only 51 per cent. Contraceptive advice represents the major part of the work in the center under the auspices of the Bund für Mutterschutz, and of course, in the centers of the lay organizations for birth control and sex advice. Contraceptive advice was sought in the seven centers of the Ortskrankenkassen in Berlin in 80 per cent of the cases for the year of 1928, and in 76 per cent for the year of 1931. In Frankfurt-am-Main, a joint venture of municipality and the Bund für Mutterschutz it was 80 per cent for the year of 1930<sup>19</sup> and in Hamburg the Bund für Mutterschutz also reports birth control advice in 80 per cent of its cases. In Dresden, however, and in Berlin-Prenzlauerberg birth control advice was given in 10 per cent and 7 per cent respectively in the years 1929 to 1931.

The next group of applicants are women, who come for a physician's certification for a therapeutic abortion. In most of the German states two, and in some, three physicians' certificates are needed to get the women's hospital, that is, Government institutions, to induce a therapeutic abortion. Such certificates are given free of charge in the municipal centers if the status of health of the applicant indicates this procedure. The Frankfurt center reports that for a period of six years, 46 per cent of its cases applied for therapeutic abortion, while in 1930, there were only 36 per cent that did so. The number of applications for therapeutic abortions decreased, while the applications for contraceptive measures increased. The various marriage advice centers list from 2.5 to 10 per cent of the total applicants as seeking certification for abortion. A great many requests are not granted, lacking medical indications. The Frankfurt center reports for 1929 and 1930 a lack of medical indications for attestation for a therapeutic abortion in 186 cases; the total number of cases for these years is not given. Of these, 145 were married and 41 were single. At the time of reporting, 49 children had been born and in 19 cases pregnancy was not yet at term. Spontaneous abortion was recorded in 31 cases and 45 are believed to have been artificially induced abortions. Thus somewhat more than one-third of the 186 pregnancies could have resulted in living issue. The Berlin-Kreuzberg center for 1931 reports inadequate medical indications for attestation for therapeutic abortion in 49 cases or 4.5 per cent of its total applicants, and in 1929 there were 46 cases or 12 per cent of the total applicants.

All sorts of estimates on the extent of the practice of abortion are circulated in Germany and elsewhere, but supporting data have not been published so far. The medical groups, the Krankenkassen, as well as all groups interested in maternal health are much concerned about the increasing number of abortions. Definite efforts are made to combat abortion by teaching the women methods that are less harmful to their physical and mental health by the prescribing of contraceptive methods in maternity hospitals and gynecologic clinics.

Certification for sterilization is still another part of the work. The Frankfurt center reports that 435 patients were recommended for sterilization operation, or, 5.6 per cent of its total cases, while in Lübeck<sup>20</sup> sterilization, operation was advised in 12 per cent of the total cases for the year of 1931. The Dresden<sup>21</sup> center in 184 or 5.2 per cent of its 3140 patients, who had applied for premarital consultation during the years from October, 1926, to January, 1930, advised on eugenic grounds against having children. Some of these had been sterilized, and some had been given contraceptive advice. The State and sometimes the Ortskrankenkassen, or the applicants themselves, carried the financial burden of those operations in Dresden, in Lübeck, and in Frankfurt-am-Main.

Involuntary sterility is the fourth cause bringing married people to the advice center. It is estimated that one in ten couples is involuntarily sterile in Germany, Austria, and Switzerland. However, figures to support such estimates are not available. The Dresden centers have a good many applicants falling into this category, and the Bund für Mutterschutz also lists in its various centers a number of cases of involuntary sterility.

In the Dresden center it was found that azoospermia was the reason for the sterility in two-thirds of the cases applying for advice on this problem. There is no statement on the underlying causes of this condition, nor about causes of sterility in the woman. The data also do not give the number or the percentages in relation to the total number of 5596 patients who were advised during the period from October, 1926 to January, 1933.

Men and women, married and unmarried, who want guidance on sex and other personal problems, constitute the third main group of applicants. They are reported for example, in Dresden and Hamburg, in about one in three cases, and in Berlin-Friedrichshain one in five.

The scope of the marriage advice centers covers, beyond the strictly medical cases relating to propagation a large number of various conflicts in marriage, personal problems affecting family relations, and these are the real test of adequate marriage counsel. Such difficulties often are a result of ignorance of the marital relationship, or, they may be purely economic or arise from outside interference. More fundamental still, these may be of a change in attitude toward each other, which creates difficulties of psychologic adjustment. Frequently it is the causative factor in the breaking down after a number of years of successful married life, and may even lead to a divorce. In most of the marriage centers, legal advice is available, and in many centers the lawyer has office hours at the same time as the medical adviser, thus saving the patient's time and money to return to the center for a second consultation.

Statistical data on legal advice, which were published in Dresden<sup>22</sup> on applicants for 1930, give a good picture of the type of reasons for coming to the center. The 326 applications fall into the following categories: Cruelty and drunkenness making for the disruption and disintegration of the family are listed in two-fifths of the cases. Economic questions of household management and questions of property rights are one-fifth, adultery is somewhat less than one-fifth, and legal questions on marital rights are one-eighth. The social status of these applicants is that of the workman in various trades, and clerks in offices. Among these families one-third are childless, one-third have one child, and the remaining have two or more children. Needless to say, the group with the greater number of children is identical with the group which has difficulties in budgeting and household economics, showing that in a large number of so-called marital maladjustments the causative factors are of a financial nature.

The outstanding advantage of the marriage advice center is the opportunity it affords the consultant to get unbiased advice on eugenic questions and on sex problems. His private physician might not offer advice so readily for financial and other considerations concerning which the patient often feels less embarrassment in consulting a stranger.

#### SUMMARY

The marriage consultation movement received its impetus from several sources. First, from such advances in scientific knowledge as those made by Mendel, Darwin, and later applied by Galton. Second, from problems of disease, poverty and other social ills, which severely taxed public and private resources. Third, from changes precipitated by the World War, such as loss of men, shortage of dwellings, an accelerated falling of the birth rate and an increase in divorces.

From the university groups interested in public health and race improvement, the eugenic ideal of the sacred duty of every human being to pass on a good heredity was upheld in the classroom, through personal conferences, on the lecture platform, and in writing. In this way, it was carried over to leaders in the community, and in some degree to the general public.

The private agencies gradually perceiving the applicability of such teachings to prevalent social and physical ills, actively promoted discussion, and even advocated such definite measures to keep the unfit from propagation as exchange of marriage health certificates, birth control, therapeutic abortion, and sterilization. A general movement, sponsored by the Society for the Protection of Motherhood, at first proved distinctly unpopular, but finally won recognition, and even support from the Government.

Today there are over a thousand consultation centers in Germany, under municipal auspices, sickness insurance, or private control. By far the largest number of consultants turn to the Krankenkassen and to the municipal centers. At present consultations are free of charge.

The marriage consultation centers for the most part are directed by physicians with certain special qualifications, who are chosen from the civil service list. It is generally felt that the experiment will stand or fall by the personal merits of the counselors, because of the high degree of tact, understanding and sensitiveness called for which no amount of specific training can supply. The physician schooled in public health and general medicine takes precedence over those specializing in any particular domain of clinical medicine, partly to avoid the danger of over-emphasizing the particular speciality, and partly from a variety of other reasons. The urologist, for example, is not regarded as a happy choice, as persons might be deterred from seeking advice because of the fear of being suspected by others of having a venereal disease. The choice of a gynecologist or obstetrician is not viewed with favor because the centers wish to limit their service to consultation and advice, a task considered more difficult in these specialties where the patient recognizing the close relationship between the technic of examination and treatment, expects to receive treatment also. An added objection arises because the nature of the specialty naturally leads to an expectation that birth control instruction may be readily obtained. Hence the broader purpose of giving marital advice on any problem may, it is feared, narrow to the giving of contraceptive advice only. Still other considerations render the psychiatrist or tuberculosis specialist a less desirable choice. Some authorities have called attention to the danger not only of letting hereditary factors overrule human considerations, but of inducing a hypochondriacal condition by overemphasis of the individual's potentialities for hereditary taints.

At present advice and guidance are sought chiefly in relation to family problems. Advice in the sense decreed by the Government, namely to determine mental and physical fitness for marriage and propagation represent a relatively small proportion of the total number of applicants. The people had not been sufficiently educated in advance to respond to a decree calling for race improvement. Apparently the necessity of awakening a eugenic consciousness through years of educational work with the public had not been sufficiently stressed. Furthermore even now scientifically documented material in the heredity prognosis of various conditions is available in but a limited number of diseases.

In general the centers give advice only. If treatment is required, the applicant is referred to medical or social welfare agencies. An outstanding exception is the giving of contraceptive instruction in certain centers.



With the rapid advance in science and consequent changing concepts, public confidence in medical, legal, and even spiritual advisers had been severely undermined. People everywhere were groping for new light on their personal problems. Gradually these groups recognized that they must meet the changing situation and devise means of satisfying new demands by establishing consultation centers.

So far no systematic analysis of the available case material has been attempted. The policies of the various centers are not sufficiently defined and standardized to permit evaluation. A noticeable increase in the number of applicants is in itself no criterion of effectiveness. Leaders in the movement increasingly recognize the need of knowing how many families, or individuals have definitely benefited from the advice given, and how many cases were helped by the treatment for which they were referred elsewhere. They are now planning uniform records that will form the basis of comparable statistics in the field. At present it is impossible to judge conclusively the ultimate value of the whole endeavor, particularly as few of these centers have been in operation as long as five years.

An important by-product of marriage consultation service is the detection of pathologic conditions of which the consultant is often totally unaware. By continually referring such patients for treatment, these centers render valuable service in the field of preventive medicine.

19 EAST THIRTY-FIRST STREET.

#### REFERENCES

- (1) *Flaskamp (Erlangen), Ehekrankheit and Ehehilfe*: München. med. Wehnschr. No. 29, 1253, 1928. Quoted from Nevermann: Ueber Eheberatung, Leipzig, 1931, Verlag Kurt Kabitzsch, p. 24.
- (2) *Lotte Neisser-Schroeter*: Enquete über die Ehe und Sexualberatungsstellen in Deutschland mit Berücksichtigung der Geburtenregelung, Neue Generation, Berlin, Nicholassee, 1928.
- (3) *Scheumann, F. K.*: Eheberatung als Aufgabe der Kommunen Leopold Voss, Leipzig, 1932, Kommunalärztliche Abhandlungen, p. 7.
- (4) *Muckermann, Hermann, and Othmar, Freiherr von Verschuer*: Eugenische Eheberatung, Berlin and Bonn, 1931, Fred. Dümmler Verlag, p. 12.
- (5) *Thiele, A.*: Praxis der Eheberatung, Schriftenreihe der Blätter für Wohlfahrtspflege. Sächsisches Landeswohlfahrts und Jugendamt, No. 19, Dresden, 1931.
- (6) *Bendix, Kurt*: Sexualberatung und Krankenversicherung. Im Bericht über den 33. Deutschen Krankenkassentag in Nürnberg, 1930, p. 3.
- (7) *Lehfeld, Hans*: Die Laienorganisation für Geburtenregelung. Archiv für Bevölkerungspolitik, Sexualethik und Familienkunde, Berlin, Dienst am Leben 2: 63, 1931.
- (8) *Kautsky, Karl*: Eheberatungsstelle der Gemeinde Wien. Sonderabdruck aus, Blätter für das Wohlfahrtswesen, 29 Jahrgang, No. 282.
- (9) *Fetscher, R.*: Arch. f. Rasse u. Gesellsch. 25: No. 3, p. 308.
- (10) *Scheumann, F. K.*: Eheberatung als Aufgabe der Kommunen. Kommunalärztliche Abhandlungen, Verlag Voss, Leipzig, 1932.
- (11) Vertrauensstelle für Verlobte und Eheleute, Gesundheitsbehörde, Hamburg, unpublished report.
- (12) *Bendix, Kurt*: Bericht über die Ehe und Sexualberatungsstellen des Verbandes der Krankenkassen, Berlin, 1929.
- (13) *Bendix, Kurt*: Physician in Chief of the Outpatient Clinics of the Ortskrankenkassen of Berlin. Unpublished material.
- (14) *Fink, Lotte*: Schwangerschaftsunterbrechung und Erfahrungen aus Eheberatung und Sexualberatung, Die Aerztin, March, 1931.
- (15) *Scheumann, F. K.*: Eheberatung als Aufgabe der Kommunen. Kommunalärztliche Abhandlungen, Leipzig, Verlag Leopold Voss, 1932.
- (16) *Rosenthal, Franz*: Ehe und Sexualberatung. Berlin-Kreuzberg, 1929. Neue Generation. September, 1930, September, 1931, and May, 1932.
- (17) *Hodann, Max*: Fürsorgestelle für Sexualberatung und Geburtenregelung in Berlin-Reinickendorf. Unpublished material.
- (18) *Hirsch, Max*: Deutsche med. Wehnschr. No. 18, 1931.
- (19) *Nevermann, Hans*: Ueber Eheberatung, Leipzig, 1931, Verlag Kabitzsch, p. 60.
- (20) *Meyer, Jakob*: Jahresbericht der Eheberatungsstelle. Lübeck, 1931, 1932. Unpublished report.
- (21) *Memmelsdorff, F. and Scheumann, F. K.*: Ztschr. f. ges. u. Gesundh., No. 19, 470, 1932.
- (22) *Martens, Agnes*: Edelman. Zur Statistik der Eheberatung Archiv für Sozial Hygiene und Demographie. 7: 229, 1932.

# Department of Maternal Welfare

CONDUCTED BY FRED L. ADAIR, M.D., CHICAGO, ILL.

## PRENATAL WORK IN NEWARK, N. J.

ABOUT 1925 the Maternal Welfare Commission of the Essex County Medical Society began a study of the maternal mortality in Newark, N. J.

The survey showed an utter lack of prenatal care. Only a small percentage of the expectant mothers received any care whatsoever.

With this information on hand, the Maternal Welfare Commission interested the City Commissioners and as a result, the Prenatal Welfare Center, under the Department of Public Works, was organized in June, 1926. This is the only organization of its kind under municipal control in this country.

The Director of Public Works, cooperating with the County Medical Society, appointed a Medical Advisory Board consisting of eight physicians with Dr. J.

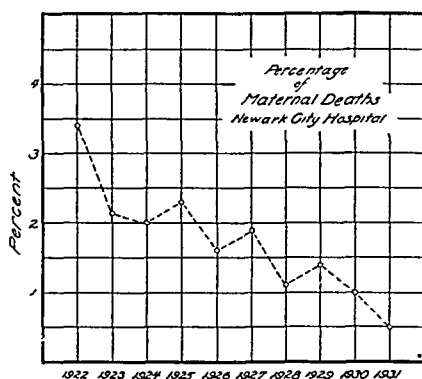


Fig. 1.

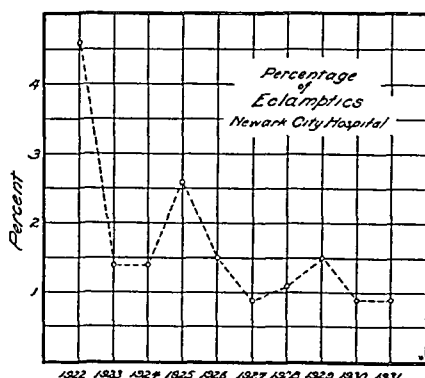


Fig. 2.

N. Pannullo of Newark, as chairman, who are connected with the various hospitals in the city having obstetric services. The Medical Director of the Center, Dr. E. H. Snively, is the Medical Director of the Newark City Hospital.

This Prenatal Welfare Center stands ready to aid the medical profession in spreading the gospel of prenatal care to the expectant mothers who cannot afford the services of private physicians.

In order to find patients early in pregnancy, nurses conduct a house-to-house canvass as they go about their districts caring for those patients who have been reported by physicians, midwives, health and welfare agencies, or who have applied for care themselves. The nurses do not give care to the private patients of physicians unless approved by the physicians.

The supervision during pregnancy consists of visits to each patient in her home and the visits of the patient to the physicians at the various clinics operated by the Center.

There are four of these weekly prenatal clinics located in different sections of the city, each clinic having two physicians and two nurses in attendance.

The patients' visits to the clinics make possible medical supervision for those patients who will be delivered by midwives and those who delay in engaging their own physicians, or registering at hospitals or those who cannot afford to pay for prenatal care.

At the clinics a complete physical examination is made. This includes examination of head, chest, blood pressure, urinalysis, pelvic measurements, and Wassermann test. Patients are urged to return to the clinics every two weeks for examination up to the eighth month and weekly thereafter. When they fail to do so, or they cannot attend clinics for some reason, the nurses follow up the cases at home.

The city is divided into eight districts with a nurse in each district. The home visits of the nurses include temperature, pulse, respiration, blood pressure, simple urinalysis, instructions as to hygiene, diet, and preparation for delivery. Social problems are encountered and referred to the proper agencies for settlement.

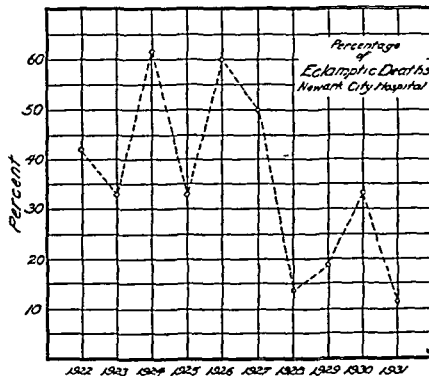


Fig. 3.

In the five years that this Center has been functioning, 14,917 expectant mothers have received prenatal care and they have made 22,101 visits to the prenatal clinics.

Since 1926 when this work started, the maternal death rate has declined yearly. In 1925 there were 88 mothers who died in childbirth of the 10,852 births in Newark. In 1931 there were 34 maternal deaths in 9506 births.

The Prenatal Welfare Center had 59 maternal deaths out of 14,917 cases in its five years of existence. These patients were practically all in the indigent class and a large percentage was colored. Of the 59 deaths, only 31 were obstetric deaths, the others being medical conditions, such as pneumonia, cardiacs, advanced tuberculosis, cancer, etc., which have complicated pregnancy.

The advantage of the prenatal work is well shown in the charts of the percentage of eclampsias and maternal deaths in the City Hospital, where the majority of these patients were delivered.

The Prenatal Advisory Board firmly believes that the Prenatal Center has helped lower maternal mortality, and educated the laity to the necessity of prenatal care.

# Department of Reviews and Abstracts

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CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

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## Selected Abstracts

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### Endocrinology

Fluhmann: Anterior Pituitary Hormone in the Blood of Women, *Endocrinology* 15: 177, 1931.

Fluhmann applies the Aschheim-Zondek procedure to the examination of the blood of nonpregnant women and thinks it has important clinical significance. The technic of the test is described in a previous article by him and the present report is based on the results of the test performed on 280 nonpregnant women in whom no gross lesions of the pelvic structures could be demonstrated, and including 178 cases used in previous papers. The study resulted in the classification of four main groups of patients: (1) Normal ovarian function; (2) Hypohormonal conditions; (3) Afunctional conditions and (4) Hyperhormonal conditions.

Several possibilities in each group are considered.

Conclusions: (1) Normal ovarian function: The test has been found negative in patients with a normal twenty-eight-day menstrual cycle. (2) Hypohormonal conditions: The test has also been negative in women with irregular, delayed, scanty, or absent menses. It would seem that this group offers the most favorable prognosis for treatment with "ovary-stimulating" extracts. (3) Afunctional conditions: The presence of large amounts of anterior pituitary sex hormone has been demonstrated in a large percentage of patients with a total deficiency of ovarian function, such as occurs after operative extirpation of the ovaries, radiation castration, and in the postclimacteric period. It is probable that some women with prolonged periods of amenorrhea, and frequently accompanied by obesity, also belong to this category. (4) Hyperhormonal conditions: One-third of younger women with polymenorrhea and patients of the menopausal age with menstrual irregularities have also shown excessive amounts of the anterior lobe sex factors in the blood. It is possible that this is due to a primary hyperfunction of the anterior hypophysis which results in an excessive production of ovary-stimulating substances.

WILLIAM KERWIN.

Loeser, Alfred: The Skin as a Hormone Bearer During Pregnancy, *Zentralbl. f. Gynäk.* 56: 1155, 1932.

Skin was obtained from 14 pregnant women, either during laparotomy for intercurrent disease or during cesarean section at term. It was denuded of underlying tissue, and pieces not less than 10 by 10 mm., weighing at least 100 mg., were implanted under the skin of infantile rats, castrated infantile and castrated adult rats. The Allen-Doisy test was negative in every instance, however, ripe follicles, estrus, and (when large pieces of skin were used), corpus luteum were found. The

greatest amount of hormone in the skin was ascertained in early pregnancy (four to six weeks), less was found at the 4-5 month period, and the least amount in skin of patients at term. At least five times as much urine as skin (by weight) is necessary to give a reaction. The author realizes that lymph and serum are implanted with the skin and that this constitutes an objection to the study.

The question was raised as to whether the concentration of hormone in the skin has anything to do with skin pigmentation during pregnancy, but skin taken from the linea nigra and from other parts of the abdominal wall of the same individual did not give any appreciable difference in reaction.

WILLIAM F. MENGERT.

**Anselmino and Hoffman: Increase of Hormones of Posterior Lobe of Hypophysis in Blood of Pregnant Women and Its Relation to the Type and Severity of Clinical Manifestations in Nephropathy and Eclampsia, Arch. f. Gynäk. 147: 549, 1931.**

The authors determined the antidiuretic component of the hormone of the posterior lobe of the hypophysis and the blood pressure increasing portion in the blood of 21 pregnant women suffering either from nephropathy of pregnancy or eclampsia. The quantity of the antidiuretic substance found was directly proportional to the severity of the pathology present. Thirty hours following delivery, this antidiuretic substance had disappeared from the blood stream. The one exception, where it persisted, was a woman suffering from puerperal eclampsia. This antidiuretic substance could not be found in the blood of healthy gravidæ or in those suffering from simple edema. The blood pressure increasing substance was found in all women suffering from definite hypertension. This blood pressure increasing substance and the antidiuretic substance apparently occur independently of each other.

RALPH A. REIS.

**Parfenoff, N.: The Relationship Between the Uterus and the Ovaries, Monatschr. f. Geburtsh. u. Gynäk. 88: 423, 1931.**

From a study of the literature and his own animal experiments, Parfenoff concludes that removal of the uterus in white rats produces severe degenerative changes in the ovaries especially in the follicle apparatus. These changes are not dependent upon lesions of the circulatory or nervous connections of the uterus. The latter organ possesses the ability to produce a hormone which stimulates the function of the ovaries by way of the blood stream. The pseudocorpora lutea must be considered histologically chiefly as of connective tissue origin but also in part of epithelial origin. They develop at the site of, and at the expense of, the growing follicles. Extirpation of the uterus stimulates the development of the interstitial glands which because of their growth lead to atrophy of the follicles.

J. P. GREENHILL.

**Engelbach: Endocrine Factors Related to Genital Development, Am. J. Surg. 19: 72, 1933.**

Engelbach divides the general scheme of the interrelationship of the glands of internal secretion into two hormonal phases. The first phase is that of the action of the hormones of the thyroid, pituitary, suprarenal cortex and the placenta (in the female) upon the follicle of the ovary, and the spermatogenic capsule of Sertoli of the testicle. The hormonal action of these endocrine glands induces cytologic and

functional changes in the follicle and the spermatic capsule which in turn result in a liberation of the hormones from these structures. The second phase is that resulting from the hormones of the ovary and the testicle upon their accessory structures such as the uterus, endometrium, tubes, vagina, and mammary glands in the female, and seminal vesicles, prostate, and external genitalia in the male. The direct action of thyroxin upon gonadal function is that of inhibition as demonstrated by the female cretin in whom thyroxin is deficient, but who has an earlier period of maturity. The author states that the hypophysis is the most important internal gland in the body, and is the center of hormonal action. Its eosinophilic cells furnish the body with the growth hormone, while the basophilic cells are the origin of the pituitary sex hormones. The normal balance of the hormonal phases as well as the hormones themselves offer normal growth and sexual development to mankind. Four illustrative cases are reported of the hypopituitarism and adiposogenital variety which were definitely helped by hypodermic injections of the pituitary growth hormone.

J. THORNWELL WITHERSPOON.

**Malinovsky, Kushnir, and Petroff:** The Mitochondrial Structure of the Cells of the Corpus Luteum Menstruale, *Acta Gynaec. (Moscow Edition)* 1: 7, 1930.

The authors describe in detail 14 corpora lutea studied in different periods of the menstrual cycle.

In summarizing, they emphasize two points:

1. The young cells of the corpus luteum just beginning to function show the granulated mitochondrial structure. A corpus luteum taken on the thirteenth day after the beginning of the last menstruation, from the standpoint of morphologic metabolism, still shows signs of retrogression, but when taken after the fifteenth day, exhibits a granulated mitochondrial structure. For this reason they consider the beginning of the development of the corpus luteum, i.e., ovulation, to be fourteen or fifteen days after the first day of the last menstruation.

2. The most intensive functional activity of the cells takes place in the first five to seven days of life of the corpus luteum.

The authors do not agree with the opinion of Robert Meyer that the so-called maturity of the corpus luteum continues until the beginning of the next menstruation and insist that from the seventh day of the life of the corpus luteum until the moment of the beginning of menstruation, the process of gradual exhaustion continues in the cells and that the period of maturity in the sense of morphologic metabolism begins even in the period of vascularization. Also their second conclusion disagrees with the theory of Robert Meyer that the corpus luteum continues to mature as long as the ovum is alive. The authors find that the vitality of the corpus luteum can in no way be connected with the vitality of the ovum and on the basis of the facts about the morphologic metabolism of the cells of the corpus luteum, they conclude that the life of the ovum is much shorter than the life of the corpus luteum.

ALEXANDER GABRIELIANZ.

**Lvov, N., and Freiman, S. X.:** The Interstitial Gland of the Human Ovary, *Acta Gynaec. (Moscow Edition)* 1: 25, 1930.

The authors studied the ovaries of 46 individuals of all ages ranging from that of a four months' fetus to that of a woman aged 60 years. They also examined ovaries of four women who died in the first half of pregnancy. Altogether they

studied 1000 microscopic sections stained with (1) haematoxylin-eosin; (2) by the Van Gieson, and (3) by the Weigerth-Hart method for elastic tissue. The authors came to the conclusion that the interstitial gland is present in human beings as a well-developed formation only before the beginning of sexual maturity, but is far from constant even at that age. It was observed only in 6 cases out of the 46. In the fetal stage, no well-marked interstitial gland was found.

ALEXANDER GABRIELIANZ.

**Campbell, A. D., and Collip, J. B.: Further Clinical Studies on the Anterior Pituitary-like Hormone of the Human Placenta, Canadian M. A. J. 25: 9, 1931.**

This series comprises 40 menorrhagias and metrorrhagias in patients free from pelvic infections and palpable tumors. From 1 to 2 c.c. of specially prepared extract were given subcutaneously every twenty-four to forty-eight hours for varying periods, depending upon the condition and history of case, each c.c. containing 40 rat units.

It is felt that simple menorrhagias are helped by the administration of this therapy for one week before the epoch, while the severe types require therapy for twelve weeks or more to correct the periods. After correction the metrorrhagias are not prone necessarily to have normal periods, and even amenorrhea may develop. Curettage sometimes shortens the period of treatment. Severe dysmenorrhea subsequent to treatment "may be of prognostic value."

H. CLOSE HESSELTINE.

**Collip, Thomson, Browne, McPhail, and Williamson: Placental Hormones, Endocrinology 15: 315, 1931.**

The authors give a brief account of the methods used and the results obtained in studies on placental hormone. Human placentas were used. Emmenin, the term applied to the hormone procured from placentas, by oral administration, produces estrus in immature female rats in from three to five days. No effects were observed in either young or mature male rats treated with emmenin. In no instance has there been any evidence of the formation of corpora lutea nor at any time has true hypertrophy of the ovaries been observed. The extract is without effect on adult castrates unless very large doses are given. If any effect occurs it is attributed to estrin which had not been removed from the extract. Emmenin does not shorten the time of the appearance of normal puberty and maturity.

Physiologic effects of the second principle which they have obtained from human placentas in the form of purified extract of a protein-like substance, are as follows: Immature rats injected daily for three days manifested estrus on the third to the fifth day. With a minimum dose both gross and microscopic examination of the ovaries show very little effect, whereas, if the dose is trebled the ovaries show young corpora lutea and healthy follicles in the course of maturation. Continued daily administrations resulted in the appearance of normal cycles at four- or five-day intervals. Even after weeks of such treatment the ovaries on examination correspond with those of normal adults showing a rapid growth at first, which, however, does not go beyond normal adult size. If both substances are administered simultaneously for a prolonged period the cycles are broken and a long period of diestrus results. The ovaries after three weeks of such treatment are extensively luteinized and greatly enlarged. Suggestions for the clinical use of the two placental extracts are given.

WILLIAM KERWIN.

Kovacs, F.: The Pathology of Hirsutism and Virility, *Monatschr. f. Geburtsh. u. Gynäk.* 91: 65, 1932.

Kovacs reports a rare case in which a woman developed among other masculine characteristics a marked increase of hair all over the body and especially a full-grown beard. This is the first recorded case in which the removal of the ovaries in a patient who did not have a suprarenal tumor, resulted in hirsutism. The author draws a practical conclusion from this case, namely that the removal of both ovaries may in certain cases not only lead to the usual symptoms of the menopause but it may also result in severe somatic and biologic disturbances. Therefore in a deliberation between surgical and radiation castration we should take into consideration not only the patient's age, family and relationships, etc., but also where possible the constitutional type of the individual with special reference to the intersexual type and latent heterosexual peculiarities.

J. P. GREENHILL.

Bokelmann and Scheringer: The Influence of Castration on the Thyroid in Female Albino Rats, *Arch. f. Gynäk.* 148: 1, 1932.

The authors found that the thyroid gland of female albino rats becomes smaller in size and richer in iodine content following castration. A decrease in the size of the thyroid or an increase in iodine content alone are of no significance; when found combined, however, it must mean that definite ovarian atrophy is taking place. This functional and structural atrophy begins promptly after castration and is demonstrable within five weeks.

RALPH A. REIS.

Englehart: The Action of Suprarenal Cortex on the Genitalia of White Female Rabbits, *Arch. f. Gynäk.* 149: 688, 1932.

Extract of suprarenal cortex produces a marked hypertrophy of the uterus and breasts of female rabbits. Injected into rats, it produces estrus. Liver and brain extracts were used as controls but results obtained by the use of these latter substances were slight. The effect of the injection of the extract of suprarenal cortex occurs even after extirpation of the ovaries and is similar to that produced by the female sex hormone.

RALPH A. REIS.

Danaff, Georg: Some Observations on the Effect of Thymus Extracts on the Uterus, *Zentralbl. f. Gynäk.* 55: 2706, 1931.

Thymus extract obtained from prematurely and stillborn children was injected under the skin of the back of female mice and guinea pigs which were in the second half of pregnancy, in three doses of  $\frac{1}{2}$  and 1 c.c. respectively, in the course of twenty-four hours, and labor was instituted in all. Similar injections in non-gravid females produced hyperemia and swelling of the genitals and hypertrophy of the uterus. No result was seen on the extirpated, nonpregnant uterus of the guinea pig, but intramuscular injections into the animal with the uterus in situ produced seemingly painful contractions of the organ. Thymus extract from very young animals gave no results. Extracts of other ductless glands gave no appreciable results in connection with the birth process with the exception of adrenalin, which in a single instance appeared to accelerate the action of thymus. The



author concludes that his results make it seem probable that beginning secretion of the thymus of the fetus is an important factor in the causation of labor.

WILLIAM F. MENGERT.

Tschaikowsky, W. K.: *Physiologic Action of Folliculin Upon the Pregnant Uterus*, Zentralbl. f. Gynäk. 56: 395, 1932.

Before proceeding to the main part of his paper, the author reviews several facts concerning the hormones of pregnancy: (a) the folliculin content of the serum rises toward the end of pregnancy; (b) the prolactin content does not rise and even falls during the last three months; (c) corpus luteum is in regression at the end of pregnancy and inhibits the sensitiveness of the uterus for posterior pituitary.

Twenty-two white mice in the second half of pregnancy were injected with 2.5 c.c. of a lipid emulsion of folliculin daily for several days. Two or three days after the injections were begun energetic contractions of the uterine horns appeared within twenty to twenty-five minutes after the previous injection. The pains which came at three- to five-minute intervals and lasted one to one and one-half minutes, slowly disappeared two or three hours later. Usually the mice aborted three to four days after injection, and the nearer they were to the end of pregnancy the more energetic were the uterine contractions. The following conclusions were drawn: Folliculin sensitizes the uterus for the action of posterior pituitary hormone. It raises the restraining action of corpus luteum on posterior pituitary. The decrease of prolactin production at the end of pregnancy causes diminished luteinization of the ovaries and therefore promotes the supremacy of folliculin over corpus luteum.

Therefore, weak pains during labor are an expression of an overproduction of corpus luteum or an insufficient production of folliculin.

WILLIAM F. MENGERT.

Hamblen: *Clinical Experience With Follicular and Hypophyseal Hormones*, Endocrinology 15: 184, 1931.

Hamblen reports the clinical results obtained with theelin and anterior pituitary luteinizing hormone. He cites forty case reports and summarizes the results of treatment as follows:

Thirteen patients with menopausal symptoms were treated. The relief of subjective symptoms was excellent in 8 patients and good in 4. One patient received no benefit. There was no effect on menstruation in 10 cases; menorrhagia developed in one patient; menstruation became more regular in two patients.

In 10 patients with amenorrhea (primary and secondary) the relief of associated symptoms was excellent in 7, good in 3. Menstruation was initiated in the four patients of the primary type of amenorrhea; menstruation recurred in 5 of the 6 patients with secondary amenorrhea.

Of 8 patients with oligomenorrhea the relief of the associated symptoms was excellent in 4 and good in the remaining 4. In all cases menstruation became more regular and the flow was of a more normal type.

Among 6 patients with idiopathic menorrhagia in 4 there was no benefit; in the two in which parathormone and calcium lactate were used in addition to theelin the results were excellent.

In 3 patients with hyperemesis gravidarum vomiting ceased. One patient returned after three weeks with an incomplete abortion.

WILLIAM KERWIN.

**Laqueur, Wagner, von den Velden and others:** Evaluation of Ovarian Hormone Therapy, A Symposium Before the Berlin Medical Society, Deutsche med. Wchnschr. 58: 959 and 992, 1932.

The recent advance in biologic research toward the identification and isolation of the ovarian hormones has so far failed to produce a simple and reliable test with which indications and results of hormone substitution therapy can be appraised in a manner approaching the exactness of the biologic experiment. The impressions of the clinician are still for the most part the sole guidance in this broad field of therapeutic endeavor. However, the impression is prevailing that the new preparations, either of pure follicle hormone or ovarian extracts with standardized contents of follicle hormone, are of distinct value in treating the general symptoms of premature or artificial menopause, in restarting menstruation if amenorrhea is due to insufficiency of the follicle apparatus, and in the treatment of endocrine arthropathies where results have been also obtained in male patients.

More uncertain is the indication in most cases of hypoplasia of the uterus with menstrual disorder, in metrorrhagia due to ovarian dysfunction and in cases of sterility. The most emphatic recognition of the new preparations comes from a psychiatrist: Climacteric depressive psychosis often yields in a very short time to a treatment of three times 200 M.U. of follicle hormone daily. Oral administration of follicle hormone is generally conceded to be as efficacious as parenteral injections in most cases amenable to treatment.

G. E. GRUENFELD.

**Webster, Bruce:** Ovarian Follicle Hormone Therapy in Ovarian Insufficiency and the Menopause, Am. J. Med. Sc. 184: 822, 1932.

A series of 20 cases is presented in which the intravaginal administration of the ovarian follicle hormone has been alternated with controlled periods. It would appear that the preparation of the hormone used was physiologically active in humans as evidenced by the induction of uterine bleeding. Additional data are presented which suggest that this hormone of the ovarian follicle is of definite clinical therapeutic value in the treatment of the disagreeable symptoms which may accompany the menopause and of the amenorrhea due to an insufficiency of this hormone. No beneficial results were obtained when the hormone was administered to cases of amenorrhea which showed clinical evidences of an anterior pituitary etiology.

J. THORNWELL WITHERSPOON.

**Azevedo:** The Use of Insulin in the Treatment of Menorrhagias of Ovarian Etiology and in Particular in Hemorrhagic Metropathy, Rev. de gynec. e d'obst. 7: 358, 1932.

The author discusses those cases of uterine bleeding in which a microscopic examination of the endometrium demonstrates a glandular hyperplasia, distinctly different from the menstrual mucosa. This peculiar hyperplasia is due to the disturbed ovarian function, and responds to insulin therapy. Several investigators have found that there is a definite relationship between the pancreas and the ovary. Insulin is also indicated in the menorrhagias occurring during the course of acute and chronic inflammations of the adnexa.

The dose of insulin is usually 20 to 40 units per day. In some cases the dose must be increased, preferably administered in divided doses throughout the day. Several cases are reported which responded to insulin therapy when all other methods of treatment had failed.

JAMES M. PIERCE.

Roques, Frederick: *Thymophysin*, J. Obst. & Gynec. Brit. Emp. 39: 320, 1932.

Freshly prepared Thymophysin which had been kept on ice was used on 100 primiparas, and the records of the preceding 100 primiparas were taken as control cases. No patient was given Thymophysin who had: disproportion, nonengagement of head at onset of labor, malpresentations, any condition in which the blood pressure was raised, or any other complication such as cardiac disease. It was found that Thymophysin did not shorten labor or any of the stages of labor whether it was given early or late, the average duration of labor in the cases given the drug being twenty hours forty-seven minutes as against nineteen hours thirty-two minutes in patients who did not receive the drug. The incidence of perineal laceration was about the same, 28 in those receiving Thymophysin as opposed to 30 in those who did not receive it. The forceps rate was approximately the same, 13 in those receiving it as against 12 in those not receiving it. Five out of 6 patients on whom the effect on the blood pressure was studied, showed a transient increase to 10 to 20 mm. Hg. in ten minutes.

WILLIAM F. MENGERT.

Wintz, H.: *Agomensin and Sistomensin*, Monatschr. f. Geburtsh. u. Gynäk. 91: 224, 1932.

Agomensin and sistomensin have been used by Wintz for the last eighteen years. Agomensin is a water-soluble solution of corpus luteum whereas sistomensin is a fat-soluble solution. The author obtained excellent results with agomensin in selected cases of amenorrhea and in cases where he feared pregnancy might be interrupted, especially those of habitual abortion. He also produced favorable effects in cases of hyperemesis gravidarum and in patients with troublesome disturbances of the menopause.

Sistomensin, on the other hand, proved very useful in cases where there was excessive bleeding at puberty and also in cases of dysmenorrhea and polymenorrhea.

J. P. GREENHILL.

Laffont, A., and Fulconis, H.: *The Use of Urine of Pregnant Women in the Treatment of Certain Menstrual Disturbances*, Bull. de la Soc. d'Obst. et de Gynéc. 4: 243, 1931.

It is well known that the urine of pregnant women contains a large amount of anterior pituitary hormone. Laffont and Fulconis injected such urine into the rectum of women who complained of dysmenorrhea and amenorrhea. Injections were given every second day up to 8 c.c. in amount. Most of the patients had neither local nor general reactions but a few had fever and pains in the ovarian and lumbar regions. Favorable results were obtained in many cases and the authors attribute this to the follicular hormone.

J. P. GREENHILL.

# Item

## AMERICAN BOARD OF OBSTETRICS AND GYNECOLOGY

At the recent examination and subsequent meeting of the American Board of Obstetrics and Gynecology held at the Milwaukee County General Hospital, Milwaukee, June 13, 1933, the following were approved for certification by this Board. -

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WILSON, R. R.	KANSAS CITY, MO.
WINKLER, E. G.	BUFFALO, N. Y.

For information regarding subsequent examination dates, etc., apply to Dr. Paul Titus, Secretary, 1015 Highland Building, Pittsburgh, Pa.

# Books Received

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ANTE-NATAL CARE. By W. F. T. Haultain, senior assistant obstetric physician, etc., Edinburgh Royal Maternity, etc., and E. Chalmers Fahmy, assistant obstetric physician, etc., Edinburgh Royal Maternity, etc. Second edition. William Wood & Company, New York, 1932.

GONORRHOE DER WEIBLICHEN GENITALORGANE. Ein Grundriss ihrer Pathologie, Klinik und Therapie. Von Dr. Robert Joachimovits, Privatdozent fuer Geburtshilfe und Gynaekologie an der Universitaet Wien, etc. Mit 45 teils farbigen Abbildungen und 6 mehrfarbigen Tafeln. Verlag von Wilhelm Maudrich, Wien, 1933.

THE SEX TECHNIQUE IN MARRIAGE. By Dr. Isabel Emslie Hutton. Foreword by Dr. Ira S. Wile. Emerson Books, Inc., New York, 1932.

CHAPTERS IN AMERICAN OBSTETRICS. By Dr. Herbert Thoms, associate professor of obstetrics and gynecology, Yale University School of Medicine. Charles C. Thomas, Springfield, Ill., 1933.

PHOTOGRAPHISCHER ATLAS der geburtshilflich-gynaekologischen mikroskopischen Diagnostik. Von Professor Ludwig Fraenkel und Erich Fels, Universitaets-Frauenklinik in Breslau. Mit 132 Abbildungen im Atlas. Verlag von S. Karger, Berlin, 1933.

CHIRURGIE DU SYMPATHIQUE PELVIEN EN GYNECOLOGIE. Par Gaston Cotte, professeur agrégé à la Faculté de Médecine de Lyon, etc. Masson et Cie, Paris, 1932.

LECTURES ON MIDWIFERY AND INFANT CARE. A New Zealand Course. By T. F. Cockrill, lecturer to nurses at Alexandra Maternity Hospital, Wellington, etc. Coulls Somerville Wilkie, Ltd., Auckland, New Zealand, 1932.

BEWERTUNG DER OVARIALTHERAPIE. Von Prof. Dr. Ernst Laqueur, Prof. Dr. G. A. Wagner, und Prof. Dr. R. von den Velden. Verlag von Georg Thieme, Leipzig, 1933.

OUTLINE OF PREVENTIVE MEDICINE for medical practitioners and students. Prepared under the auspices of the Committee on Public Health Relations, New York Academy of Medicine. Editorial Committee: Frederic E. Sodern, Chas. Gordon Heyd and E. H. L. Corwin. Second edition, revised and enlarged. Paul Hoeber, Inc., New York, 1932.

MANOBRAS E OPERACOES OBSTETRICAS. Pela Docente Dr. Joao Pereira de camargo, Faculdade de Medicina da Universidade do Rio de Janeiro, etc. Imprensa Nacional, Rio de Janeiro, 1932.

DAS FRAUENPROBLEM DER GEGENWART. Eine psychologische Bilanz. Von Dr. Alice Ruehle-Gerstel. Verlag von S. Hirzel, Leipzig, 1932.

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## Original Communications

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### OBSERVATIONS ON THE ENDOCRINE DIAGNOSIS AND TREATMENT OF AMENORRHEA AND FUNCTIONAL UTERINE BLEEDING\*

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PHILADELPHIA, PA.

*(From the Gynecological Department of the Jefferson Medical College)*

IN A PREVIOUS communication<sup>1</sup> we noted the great number of patients suffering with functional menstrual disorders due to endocrine imbalance and formulated plans for the systematic study of such cases from the diagnostic and the therapeutic standpoint.

As a basis for diagnosis, it was proposed that in addition to the usual general and laboratory studies, tests should be made also for the determination of the estrin and of the anterior pituitary hormone content of the blood as well as a histologic study of the endometrium taken by curettage as close to the time of an expected period as possible. The test curettage and the blood hormone tests were to be made within twenty-four to thirty-six hours preceding the expected period, and if there was marked irregularity or amenorrhea, the time for the appearance of the menstrual flow was to be estimated as far as possible from menstrual moulimina. When these did not exist and no estimate of the monthly cycle was possible, blood tests for estrin determination were to be made once a week for five weeks, and the curettage undertaken as soon as a positive reaction was obtained. A positive reaction failing, the curettage was to be performed irrespective of the menstrual cycle.

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\*Read at meeting of the Obstetrical Society of Philadelphia January 5, 1933.

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NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

We expressed the opinion that endometrial curettings furnish an important clue to the functional status of the ovary and of the anterior pituitary gland upon which the activity of the ovary is founded. According to the modern conception of the anabolic phase of menstruation, the endometrium depends for its development, from the postmenstrual through the interval to the premenstrual secretory phase, upon the elaboration by the ovary of follicular and lutein hormones in the proper proportion.

Our experience with those cases in which we had been able to study simultaneously the endometrium for its histologic picture and the ovary for lutein tissue seemed to support this view.

On the basis of these facts, it was said that the endometrial picture reflects the normal activity of the ovaries and, to go a bit further, indirectly of the anterior pituitary gland, and that it reflects any deviation from the normal activity in these two glands. In other words, the presence of a premenstrual endometrium before the expected flow may be taken as evidence of normal follicular and lutein preparation which usually denotes normal pituitary and ovarian function; any deviation from these findings at this period in the monthly cycle indicates some imbalance in the pituitary and in the ovarian function.

TABLE I. ASSOCIATION BETWEEN HORMONAL TESTS AND TEST CURETTAGE IN COMBINED AMENORRHEA, UTERINE BLEEDING AND STERILITY GROUPS

TEST CURETTAGE STATE OF ENDOMETRIUM	ESTRIN TEST			ANTERIOR PITUITARY TEST			TOTAL NO. CASES
	POSITIVE	THRESHOLD	NEGATIVE	APR I	APR II-III	NEGATIVE	
Premenstrual	26	14	12	0	1*	51	52
Early premenstrual	0	0	4	0	0	4	4
Premenstrual with local hyperplasia	1	0	2	0	0	3	3
Menstrual desquamation	0	0	2	0	0	2	2
Hyperplasia	4	9	15	6	2	20	28
Local hyperplasia with interval or atrophic changes	2	2	11	2	0	13	15
Atrophy	0	6	26	20	1	11	32
Carcinoma of fundus	0	0	1	1	0	0	1
Total No. of tests	33	31	73	29	4	104	137

\*Due to pregnancy.

For the determination of estrin (female sex hormone), in the blood, the technic of Frank and Goldberger was selected and the results were classified as positive, threshold, or negative. For the determination of the anterior pituitary hormone in the blood, Fluhmann's modification of the Aschheim-Zondek test for pregnancy was selected and the results were classified on the basis of the cytologic changes in the ovary, as APR i (the ovulation reaction), APR ii (the hemorrhagic cyst reaction), APR iii (the luteinizing reaction), and also of course a negative reaction.

The purpose of the present writing is to report our experience in carrying out this plan with 174 patients in the Gynecological Endocrine Clinic at the Jefferson Hospital under the direction of Dr. Jacob Hoffman.\*

The diagnostic findings and the therapeutic results obtained up to this time are given without venturing a final judgment (see Tables I to VIII).

#### TEST FINDINGS AND THE RELATION BETWEEN THEM

These show a wide variation; they admit of explanation, sometimes hypothetical. Our impression is that histologic studies of the endometrium combined with estimations of estrin and the anterior pituitary hormone give us a reliable index of ovarian and indirectly of pituitary function, but it is quickly evident that there is no constant association between the derangement of function and the symptoms it produces.

In explanation we may simply say that disturbances in the normal stimulation of the ovary by the ductless glands and in the function of the ovary may be manifested by any abnormality of the menstrual flow† and that the relations between them are not constant. This thought has already been expressed by Zondek.

#### AMENORRHEA

There were 85 patients: almost three-fourths were between twenty and thirty-five years of age; there were 15 under twenty and 9 cases over thirty-five years. In many the symptoms associated with the amenorrhea (see Table III) caused the most distress and formed the principal complaint. The results of a complete study of fifty-two of the cases are as follows: (See Table II.)

*Endometrial Findings.*—The curettings revealed an atrophic endometrium in a little more than one-third of the cases; there was an almost equal number of cases with a premenstrual endometrium. In a few cases the endometrium was hyperplastic. The atrophic endometrium was accompanied in half of the cases with a positive anterior pituitary, in other words, with hormonal evidences of a lack of ovarian function.

The premenstrual endometrium in amenorrhea may be explained perhaps by a persistence of the corpus luteum; the continued elaboration of progestin that ensues prevents the disintegration of the endometrium and the menstrual flow. Whether the progestin has an inhibitory effect upon some positive factor in the anterior pituitary or elsewhere which is normally responsible for the uterine bleeding or whether some other mechanism is involved, one cannot say.

\*The laboratory studies were made by Dr. Jacob Hoffman in the Gynecological Research Laboratory of the Jefferson Medical College.

†Here the reader must bear in mind that what appears to be a normal or an abnormal menstrual flow may be uterine bleeding without ovulation (Corner, Robert Meyer).



TABLE II. ASSOCIATION BETWEEN HORMONAL TESTS AND TEST CURETTAGE IN AMENORRHEA

TEST CURETTAGE STATE OF ENDOMETRIUM	ESTRIN TEST			ANTERIOR PITUITARY TEST			TOTAL NO. CASES
	POSITIVE	THRESHOLD	NEGATIVE	APR I	APR II-III	NEGATIVE	
Premenstrual	9	4	4	0	1*	16	17
Early premenstrual	1	2	1	0	0	4	4
Interval	1	4	0	0	0	5	5
Hyperplasia	0	0	1	0	0	1	1
Local hyperplasia	1	2	3	1	0	5	6
Atrophy	0	2	17	9	1	9	19
Total No. of tests	12	14	26	10	2	40	52

\*Due to pregnancy.

TABLE III

ASSOCIATED SYMPTOMS AND CONDITIONS	NUMBER OF CASES		
	AMENORRHEA	UTERINE BLEEDING	TOTAL
Sterility	21	6	27
Vasomotor nervous symptoms	18	21	39
Dysmenorrhea	12	14	26
Headache (migraine)	10	17	27
Obesity	28	8	36
Secondary anemia	3	29	32
Frigidity	10	2	12
Skin eruptions	6	2	8
Retardation of secondary sex characteristics	2	0	2
Retardation of secondary sex characteristics (with hy- pophyseal cachexia)	4	0	4
Syphilis	0	4	4

So far as the hyperplastic endometrium found in a few cases of amenorrhea is concerned, the statement of Zondek may be recalled: while on the one hand a premenstrual endometrium may be accounted for by the presence of a persistent corpus luteum, on the other hand a thickened hyperplastic endometrium may be explained by persistent or atretic follicles without corpus luteum formation.

*Hormonal Findings.—Estrin:* We found the test for estrin negative in approximately one-half of the cases of amenorrhea and positive or threshold reactions almost equally divided in the other half.

*Anterior Pituitary Hormone:* The anterior pituitary test was negative in 40 of the cases; it was positive in 12. A positive finding of anterior pituitary hormone is usually indicative of a deficiency or a lack of ovarian function. Such has been the experience of Fluhmann and others. Our cases tend to agree with this view and these findings have proved in practice to be of the utmost importance from the diagnostic and the prognostic standpoint. By means of these findings it was possible to differentiate between functional amenorrhea and the amenorrhea dependent on anatomic defects (sometimes called afunctional) (Table IV). In the first, there is merely a derangement of function, which may

be restored either spontaneously or as a result of therapeutic measures. In the second, the follicular apparatus is almost entirely or wholly impaired either from actual anatomic changes such as follow x-ray or operations or even protracted inactivity with resulting atrophy or from some other unknown factors, and it cannot with rare exceptions be brought

TABLE IV. ANALYSIS OF THE ANTERIOR PITUITARY HORMONE REACTION IN 148 CASES

TYPE OF CASE	ANTERIOR PITUITARY HORMONE REACTIONS				TOTAL CASES
	APR I	APR II-III	TOTAL POSITIVES	NEGATIVE	
Normal ovarian function (regular 28-day menses)	0	0	0	28	28
Amenorrhea group (functional)*					
Oligomenorrhea, regular cycles	0	0	0	7	7
Amenorrhea, short duration	0	0	0	15	15
Amenorrhea, long duration	0	0	0	14	14
Amenorrhea, alternating with menorrhagia	0	0	0	3	3
Amenorrhea, associated with dysmenorrhea	0	0	0	3	3
Amenorrhea group (afunctional)†					
Primary amenorrhea	0	2	2	0	2
Congenital absence of uterus	0	1	1	0	1
Infantile genitalia	4	0	4	0	4
Operative castration	2	1	3	0	3
Radiation castration	1	2	3	0	3
Amenorrhea, long standing	3	0	3	0	3
Preclimacteric	1	0	1	0	1
Climacteric	0	1	1	0	1
Uterine bleeding (functional)*					
Bleeding, short duration	0	0	0	9	9
Bleeding, long duration	0	0	0	13	13
Bleeding, alternating with amenorrhea	0	0	0	7	7
Bleeding, associated with dysmenorrhea	0	0	0	7	7
Preclimacteric	0	0	0	8	8
Climacteric	0	0	0	3	3
Uterine bleeding (afunctional)†					
Bleeding, short duration	1	0	1	0	1
Bleeding, long duration	3	1	4	0	4
Preclimacteric	5	1	6	0	6
Climacteric	1	1	2	0	2
Total	21	10	31	117	148

\*Majority amenable to treatment.

†Anatomic, sometimes called afunctional; not amenable to treatment with few exceptions.

back to normal function. Some of the cases exhibiting a positive anterior pituitary were in the preclimacterium or in the menopause; the younger women exhibiting this reaction almost without exception had had operations or irradiation which had partly or entirely destroyed the ovary. When the younger women gave no history of such treatment there were

indications of infantilism (primary amenorrhea), hypophyseal cachexia and in one case congenital absence of the uterus.

Most of the patients with a positive anterior pituitary reaction, young or old, complained of troublesome vasomotor nervous symptoms and headaches. These symptoms may be due perhaps either to overactivity of the anterior pituitary gland producing an actual excess of the pituitary hormone or the excess may be relative as when the neutralizing influence of the ovarian hormones is lacking entirely or is below the normal. With rare exceptions these cases failed to respond to treatment.

TABLE V. ASSOCIATION BETWEEN HORMONAL TESTS AND TEST CURETTAGE IN FUNCTIONAL UTERINE BLEEDING

TEST CURETTAGE STATE OF ENDOMETRIUM	ESTRIN TEST			ANTERIOR PITUITARY TEST			TOTAL NO. CASES
	POSITIVE	THRESH- OLD	NEGATIVE	APR I	APR II-III	NEGATIVE	
Premenstrual	2	2	2	0	0	6	6
Early premenstrual	0	0	4	0	0	4	4
Premenstrual with local hyperplasia	1	0	2	0	0	3	3
Menstrual desquamation	0	0	2	0	0	2	2
Hyperplasia	2	5	11	5	1	12	18
Hyperplasia with fibrosis and atrophy	0	0	2	0	1	1	2
Local hyperplasia with interval	0	0	6	1	0	5	6
Atrophy	0	2	6	7	0	1	8
Total No. of tests	5	9	35	13	2	34	49

TABLE VI. THERAPEUTIC MEASURES

THERAPEUTIC AGENT	NUMBER OF CASES TREATED		
	AMENORRHEA	UTERINE BLEEDING	TOTAL
Anterior pituitary luteinizing hormone*	2	53	55
Ovarian follicular hormone*	10	0	10
Ovarian follicular hormone plus ant. pit. luteinizing hormone*	15	3	18
Thyroid	32	11	43
Pelvic massage	54	32	86
X-ray stimulation to pituitary	36	27	63
X-ray stimulation to pituitary and ovary	4	2	6
X-ray sub-castration dose to ovary	0	3	3
X-ray castration dose to ovary	0	1	1
Iodine	3	2	5

\*Furnished through the courtesy of Parke, Davis & Company.

In a few cases of amenorrhea a hyperplastic or a premenstrual endometrium appeared with positive estrin and negative anterior pituitary findings. In these the hypothesis of Zondek, mentioned above, of a polyhormonal state, that is, a condition of too much estrin (elaborated by the follicle) or a persistence of progestin (elaborated by the corpus luteum) may be reasonably explanatory. Since this is more of a derangement of function than a lack of it the prognosis is better.

It may be noted here that a positive estrin reaction just before an expected period is a reliable index at least of follicular activity. By some observers it is accepted as an index of full ovarian function. Nevertheless as it often accompanies a hyperplastic endometrium, which results from follicular without lutein activity, the endometrial curettings also must be studied in order to eliminate the possibility of misinterpretation.

#### UTERINE BLEEDING

There were 89 patients: about one-fourth were between puberty and twenty years of age; one-half were between twenty and thirty-five years of age and the remainder fell into the preclimacteric and the menopausal class. The result of a complete study of 49 of the cases is as follows: (See Table V.)

*Endometrial Findings.*—In more than half there were various degrees of endometrial hyperplasia. According to the experience of most observers, it is to be expected that this type of endometrium would accompany functional uterine bleeding. In a previous communication we gave the usual explanation of the changes in the mucosa and ventured an opinion as to the etiology of the bleeding.

Undeveloped and atrophic states of the endometrium were obtained in about 16 per cent of the cases. No conclusive explanation is offered for such findings; but we note that there were a few cases in which a second curettage revealed an atrophic endometrium although the first curettage had shown a hyperplastic endometrium. Possibly the atrophic endometrium was the end-result of the disintegration and discharge of the hyperplastic mucosa with hemorrhage and that the factors that produced the bleeding from the hyperplastic endometrium were still exerting their effect.

In 25 per cent of the cases there was a premenstrual endometrium. This may be accounted for by the hypothesis of Zondek, of polyhormonal bleeding; or, it may be ascribed to an unknown influence of the pituitary, the thyroid, or other glands. It is much more likely, however, that in such cases, despite a careful physical and pelvic examination, a constitutional disorder or a small pelvic lesion, such as a submucous fibroid, endometriosis, granulosa cell tumor of the ovary or some other condition is responsible for the symptoms and has been overlooked. We found organic lesions (myoma, endometriosis) in two patients who came to operation after treatment had failed; in both, the curettings had shown a premenstrual endometrium.

*Hormonal Findings.*—*Estrin:* Most noteworthy is the group of cases associated with various degrees of endometrial hyperplasia. It is significant that a positive estrin reaction was obtained in one-third of these cases. This would seem to lend weight to the theory which attempted to explain these so-called cases of polyhormonal bleeding (Zondek) as due

to a persistent follicle in the ovary, with subsequent accumulation and concentration of estrin, which then appears in the blood. Here there is a theoretical lack of progestin and the substitution of luteinizing hormone by injection has its typical field of usefulness. Whether, as Zondek suggests and as we have proposed in a previous communication, the polyhormonal bleeding passes into polyhormonal amenorrhea, both being of the same genetic origin, is a matter of speculation. There have been 10 cases (uterine bleeding alternating with amenorrhea) in our series in which this appears to have occurred.

*Anterior Pituitary Hormone.*—Of the 60 patients on whom this test was performed, a positive reaction was obtained in only 13 or less than 25 per cent. In every case it was associated with either a hyperplastic or an atrophic endometrium and in no instance with a premenstrual endometrium. One-half of the patients giving a positive reaction were in the reproductive period; the others being in the preclimacteric or in the menopause. In the former there had been some damage by operation or otherwise to the ovaries and in the latter a positive finding was to be expected since they were probably entering or had entered the polyprolan stage of the menopause (Zondek). In the majority, both young and old, the bleeding was of long duration and accompanied with severe vasomotor nervous symptoms and headaches. With few exceptions these cases did not respond to treatment.

We may emphasize the fact that whenever a positive anterior pituitary hormone finding appears in functional uterine bleeding as well as in amenorrhea, the prognosis is poor (see Table IV). In our experience, the bleeding can be checked in these cases only by resorting to more radical methods, such as intrauterine irradiation with radium or x-ray castration to the ovary.

#### TREATMENT

Our therapeutic agents may be grouped as follows: (See Table VI.)

1. Organotherapy (thyroid, ovary, pituitary)
2. X-ray stimulation of the anterior pituitary
3. X-ray "depression"
4. X-ray in subcastration dose to the ovary
5. Bimanual pelvic massage

Proceeding on the assumption that both amenorrhea and menorrhagia may be of the same genetic origin, no matter what the results of the functional tests in the individual case might be, some combination of these therapeutic agents was employed for the purpose: first, of restoring the normal function of the anterior pituitary and the thyroid in their activation of the ovary; second, of promoting the normal follicular development, ovulation and the formation of a corpus luteum; and third, of temporarily supplying by substitution the missing or deficient anterior

pituitary and ovarian hormones. The need of treatment in either amenorrhea or uterine bleeding sometimes arises for the most part from the associated symptoms (see Table III) that are particularly troublesome.

*Organotherapy.*—1. *Thyroid* may be most important in the treatment of amenorrhea as well as in the treatment of uterine bleeding, especially in cases associated with hypofunction of the thyroid. It was used especially when obesity was a feature of the case even if the basal metabolism was normal.

2. *Ovarian hormones* at best constitute nothing more than substitution therapy, and they proved of very little value. Anterior pituitary luteinizing hormone was nearly always combined with them for the purpose of influencing both the follicular and the lutein phase of the cycle.

3. *Anterior pituitary hormones:* Following the lead of Novak and Hurd, a luteinizing hormone was used in 50 cases of uterine bleeding. In many instances striking results were obtained. This was especially true of the adolescent cases. In some cases in which it was used with immediate success the results proved to be only temporary. The intramuscular injection of luteinizing hormone is especially adapted to the treatment of young girls, because the other forms of treatment may produce undesirable psychologic effects. It may be stated also that while the injection of luteinizing hormone in women approaching the menopause cannot be advised unless preceded by a diagnostic curettage so as to eliminate the possibility of malignancy and other organic lesions, the infrequency of such conditions in young girls makes it comparatively safe to disregard them. If luteinizing hormone fails and the indications are urgent, then complete studies and the other therapeutic methods should be tried.

Luteinizing hormone ought to be administered in large dose (maximum 200 rat units a day for 10 days) and if it is not at once effectual, several courses of treatment may be given. In a few of the cases in this series it was only after several rounds that the bleeding was controlled and the periods became regular.

*X-ray Stimulation of the Pituitary.*—Since the anterior pituitary gland is the motor of ovarian function, one may try to increase its activity by small divided doses of the x-ray. No untoward effects have been observed in our patients and in many instances favorable results have been noted. Whether they have been the direct result of the treatment is conjectural. In explanation of this statement we recall the views of some roentgenologists that the x-ray never stimulates but always destroys. Perhaps the increased activity of the anterior pituitary after so-called x-ray stimulation is produced by the destruction of inhibiting

cells in the gland structure. It is of the utmost importance that the roentgenologist fully understand the technic of the procedure.\*

*X-ray Depression of the Pituitary.*—In the future we propose to attempt depression of the anterior pituitary for the purpose of controlling troublesome vasomotor symptoms, especially headaches, in women of the preclimacterium or the early menopause. It will be limited to those in whom anterior pituitary hormone is found in the blood whether they exhibit amenorrhea or uterine bleeding and will be given on the assumption that the symptoms are produced by an excess of the anterior pituitary hormone that cannot be neutralized. Such therapy will not be used in younger women.

*X-ray Stimulation of the Ovary.*—The same question as to whether x-ray treatment can ever be stimulating applies to the ovary. One observer attributes the good effects of very mild exposures to a regression of persistent corpora lutea. Nevertheless since the follicular apparatus is especially susceptible to the x-ray, and as there is danger of irreparable damage, we have come to the conclusion that exposure of the ovary to x-ray treatment as a rule should not be used in the young or during the reproductive period. In our earlier studies this form of treatment was employed with bad results.

*X-ray in Subcastration Dose to the Ovaries.*—Partial inhibition of the ovary with the x-ray may be used at the menopause for uterine bleeding that resists other functional treatment.

X-ray in subcastration dose is adopted when the other functional plans have not sufficed; by careful dosage, the bleeding may be controlled but the menstrual periods not completely stopped. In this way patients may be eased into the menopause gradually instead of being thrust into it abruptly.

X-ray in castration dose to the ovary may ultimately be required in bleeding cases when a subcastration dose is ineffectual.

*Intrauterine Irradiation with Radium.*—Intrauterine irradiation with radium so promptly stops uterine bleeding that it has become a customary procedure in women of the preclimacterium or the menopause.

It has also been used in small doses for the intractable bleeding of young women, and it is usually quite possible to control the symptoms without any more than temporary interruption of the reproductive functions.

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\*"The stimulating dose used in treating the patients with functional amenorrhea or functional menorrhagia has been 5 milliamperes at 130 peak kilovolts through 4 millimeters of aluminum filter at 25 centimeter skin target distance for two minutes (5 ma, 130 KVP, 4 mm. Al, 25 cm. STD. 2 mins.) and is equivalent to 80r or about 15% of a skin erythema dose. This dose has been given through a port over the temporo-parietal area, the center of the port being midway between the external canthus of the eye and the external auditory meatus. The dose has been given on alternate sides at weekly intervals for four weeks, so that the patient receives in four weeks this dose to each side of the skull twice.

"For the treatment of symptoms at the menopause we have decided to use a dose three times as great. This would be obtained by increasing the time of each treatment from two minutes to six minutes, and would multiply the dose of each treatment, in terms of r units from 80r to 240r, and the percentage of the erythema dose from 15% to 45% over each side."

But there is always some risk attached to irradiation of the uterus during adolescence, and there can scarcely be any argument that in young women it is better to regulate the menstrual function by means which carry no risk whatever of ultimate harm.

The same thing may be said of all women up to the age of the menopause. But when the possibility of reproduction is about at an end and the patient desires no continuation of the menstrual periods, the rapid results that follow intrauterine irradiation seem to maintain it as the procedure of choice.

Occasionally, however, this use of irradiation is followed with disagreeable sequelae and occasionally a patient is found who objects to it from fear of these sequelae which she has observed in someone else.

And so there have been included in our series a number of women of the preclimacteric and the climacteric group in order to see how often functional treatment is successful.

As a result of our experience, it is felt that in a certain proportion of the cases heretofore treated with radium, we may be better satisfied with the functional plan. In the pursuance of the latter one guards against overlooking pelvic cancer by the preliminary examination and curettage under an anesthetic; if functional methods fail, the patient has suffered no harm and irradiation with radium or the x-ray may still be employed.

*Bimannual Pelvic Massage.*—Following the lead of veterinarians who have long used analogous methods of dealing with stagnant ovaries and sterility in cattle, this treatment was carried out in most of the cases; we are not yet convinced of its merit. The massage is given for one increasing to five minutes. When properly used\* it never produces more than slight pain and tenderness and this rapidly abates. It is employed on the assumption that a persistent follicle or a persistent corpus luteum is the cause of menstrual irregularities. Good results have seemed to follow this simple procedure in many cases. Whether it may promote rupture of the follicle by weakening its wall, or the regression of a corpus luteum by loosening its attachments one cannot say. Perhaps an improvement in the blood supply of the ovary may be explanatory. In several instances regular menstrual rhythm followed a single pelvic examination; it is true that this was probably a matter of pure coincidence; nevertheless, we cannot help asking whether one thorough palpation of a stagnant ovary may not at times produce results. Some of the good ascribed to ovarian preparations in the past may thus be explained.

Palpation of the ovaries must not be undertaken unless the condition of the parts is clear and there dare never be any suspicion of inflamma-

\*The greatest care is exercised to avoid traumatism and especially so when the ovary is definitely enlarged and evidently the seat of a cystic follicle or a persistent corpus luteum.



tory disease, intrauterine or ectopic pregnancy or ovarian neoplasms. Pelvic massage should not be used at all or only with the greatest discretion in the young unmarried woman, the pelvic finger always in the rectum.

TABLE VII. AMENORRHEA GROUP—85 CASES

RESULTS OF TREATMENT	NO. CASES	PER CENT
*Return of periods for short time	20	23
*Periods regulated for 6 months	11	13
Periods regulated for 6-12 months (to date)	8	9
Periods regulated for over a year (to date)	3	3
Relief from associated symptoms	18	21
Periods regulated followed by pregnancy	0	0
Reduction of weight	5	5
Increase in secondary sex characteristics†	4	4
Development of endometrium from atrophic to premenstrual state	4	4
Absolute failures	15	27
Patients studied but not heard from since	27	31

\*Not heard from since.

†Growth of pubic hair, development of breasts, rounding of contour.

TABLE VIII. FUNCTIONAL UTERINE BLEEDING, 89 CASES

RESULTS OF TREATMENT	NO. CASES	PER CENT
*Cessation of bleeding with regular periods for a short time	10	11
*Periods regulated for 6 months	11	12
Periods regulated for 6-12 months (to date)	16	18
Periods regulated for over 1 year (to date)	7	8
Formerly regular but profuse, now normal	2	2
Partial regulation of periods followed by amenorrhea	7	8
Return of bleeding following temporary relief	5	5
Relief from associated symptoms	16	18
Periods regulated and followed by pregnancy (sterility cases)	8	9
Absolute failure	13	14
Cases too recent to report	10	11
Cases untraceable	8	9

\*Not heard from since.

*Iodine.*—Iodine was used in a few cases of amenorrhea of long standing, associated with obesity, after all other treatment had failed. In two instances the periods returned and were regular. It may be that clinically unrecognized cases of mild hyperthyroidism may be benefited with iodine therapy which is worthy of trial when other methods have failed.

#### CONCLUSIONS

In an evaluation of this experience in the endocrine diagnosis and treatment of amenorrhea and uterine bleeding, we realize that many of our ideas of endocrinologic gynecology are based upon animal experimentation. Unfortunately, the reaction in one species of laboratory animal is not readily duplicated, if at all, in another, and it may be still less likely to occur in the human being. The reaction in the lower

animals to the experimental endocrine secretions can only suggest what may be produced in the human being, and the effect of substitution products injected into human beings may be quite unlike their effect upon experimental animals.

We bear in mind also that amenorrhea and uterine bleeding sometimes undergo spontaneous cure without any treatment whatever or after the simple procedure of curettage and pelvic examination (see Tables VII and VIII).

With the above reservations, we submit the following conclusions:

1. Histologic studies of the endometrium, combined with blood tests for estrin and anterior pituitary hormone, are of value in addition to the usual clinical and laboratory study of endocrine patients in making a complete diagnosis of the condition at hand.

2. These tests are important before treatment is instituted, not only because they afford a reasonable diagnostic basis, but also because they are a gauge, by which subsequent observations may be measured; for example, some cases which show no premenstrual changes in the endometrium at the beginning, exhibit them later when function has been restored by treatment.

3. While test curettage is valuable at any period of life in differentiating functional bleeding from uterine polyp or other intrauterine organic lesions, not recognizable by palpation, it especially ensures against overlooking early malignancy of the endometrium in the later years of the reproductive period. Test curettage should not be used in young unmarried women, unless the symptoms are urgent and other functional plans of treatment have failed.

4. The test for estrin determination, although valuable as an index of follicular activity, does not always imply full ovarian function, since positive findings may sometimes be obtained in cases of endometrial hyperplasia, which is associated with an absence of the lutein phase of the cycle.

5. The presence of anterior pituitary hormone in the blood except during pregnancy and at the menopause is of grave prognostic import and the function of such patients, with few exceptions, cannot be restored.

6. A successful response to the treatment of amenorrhea is more likely in younger women, unless associated with infantile genitalia or damaged ovaries, the result of pelvic operations or irradiation. The longer the duration of the amenorrhea the less favorable are the results.

7. Functional treatment is preferable to other forms of treatment for uterine bleeding throughout reproductive life and especially in the adolescent. In women with uterine bleeding approaching the climacterium these studies are interesting and important, and it may be that in many cases functional treatment will be found preferable to intrauterine irradiation which is the procedure usually selected.

8. Thyroid medication is apparently of service in a considerable proportion of the cases of both amenorrhea and uterine bleeding, and iodine occasionally has a place.

9. Ovarian hormones seem to be of little service.

10. Anterior pituitary luteinizing hormone in the treatment of uterine bleeding seems to be effectual in a fair proportion of cases although its mode of action is sometimes a matter of speculation.

11. Massage of the ovaries is still under trial; in many cases and especially in amenorrhea it has seemed to help in the restoration of function.

12. Stimulation of the anterior pituitary gland with the x-ray appears to be possible and is sometimes apparently responsible for a restoration of function.

#### REFERENCES

- (1) *Anspach, Brooke M., and Hoffman, Jacob*: AM. J. OBST. & GYNEC. 29: 3, 1932. (2) *Chamberlain, W. E.*: AM. J. OBST. & GYNEC. 29: 147, 1932. (3) *Fluhmann, C. F.*: Endocrinology, p. 177, May-June, 1931. (4) *Zondek, B.*: Die Hormones des Ovariums, etc., Berlin, 1931, Julius Springer, p. 242.

#### DISCUSSION

*Dr. John T. Farrell, Jr.*—I think that I can best discuss the x-ray aspect by attempting to clarify the terms of treatment. A year ago in discussing a similar paper before this Society, Dr. W. Edward Chamberlain pointed out that there is no such thing as a stimulating dose of x-ray, in the sense of stimulation of tissue growth. This is quite correct from the structural viewpoint, but so far as physiologic action is concerned one might speak of physiologic stimulation or physiologic depression in some instances. However, the roentgenologist often fails to realize that amenorrhea and menorrhagia are manifestations of the same disturbance of endocrine function, though he knows that a particular dose of x-ray administered to the pituitary in one individual will restore menstruation, while in another patient an identical dose will lead to diminution in excessive flow. This leads him to think that the gynecologist looks upon the action of the x-ray as depressive or stimulating, and confusion follows when one hears of "depressive dose" or "stimulative dose" in relation to the treatment of these functional disturbances. I think that if these terms were discarded and if one referred to these doses as "regulatory" that the roentgenologist would get a clear conception of the physiology.

The term "depressive" might be more properly reserved for reference to the treatment of that group of patients of whom Dr. Anspach spoke, who approaching the climacteric are annoyed with troublesome symptoms. In these patients one might hope to depress the function of the pituitary, and in them it would seem rational to use a larger dose of x-ray, arbitrarily two or three times as much as in the treatment of functional disturbances. On the other hand, one cannot say that the very small dose might not have the same effect in these patients that it has in the functional disturbances of younger women. In this particular group of patients it might be well to supplement the treatment of the pituitary by giving radiation over the ovary.

Dr. Anspach and Dr. Hoffman have shown commendable conservatism in their evaluation of the effect of x-ray. However, there are a sufficiently large number of similar cases, reported in the literature to substantiate the view that the x-ray is definitely of service in a certain percentage of functional disturbances of menstruation.

## A FIVE-YEAR STUDY OF ABORTION\*

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IT HAS been estimated that from 30 to 40 per cent of all pregnancies end in abortion during the first six months of intrauterine life (Watson). That it is a welcome termination in many cases is evidenced by the fact that no chance seems too great for some women to take to rid themselves of an existing pregnancy. Conversely, the loss of the fetus in women desirous of having children is often a sad disappointment and causes much unhappiness in this class of patients. Abortion does not always merely kill the fetus, but also causes the death of many women during the best years of their lives. Taussig<sup>1</sup> very aptly refers to the sword of abortion as being double-edged in its destructiveness, often causing the death of the mother as well as that of the fetus. The maternal deaths in the United States as a result of abortion are nearly as numerous as those due to childbirth. The average maternal death rate following abortion is said by Taussig to be 2.1 per cent. Based on 700,000 abortions which occur in the United States annually, this means that 15,000 women lose their lives from this cause each year. In the State of Oregon, a calculation of the death rate from causes connected with pregnancy was made for the years 1927 and 1928.<sup>2</sup> It was found that puerperal sepsis was responsible for 40.0 per cent of the maternal mortality and that 64.0 per cent of these patients died as a result of septic abortion. Much has been written regarding the prevention and treatment of puerperal sepsis but the prevention and treatment of septic abortion seems not to have been sufficiently emphasized. At present our treatment of postabortal blood stream infections is inadequate, for vaccines, antitoxins and blood transfusions are often of no avail. In teaching medical students, more emphasis should be placed on the proper management of abortion.

The object of this study is to emphasize the importance of conservatism in the handling of such cases. Every patient with a threatened, inevitable, or incomplete abortion, who has a temperature above normal, should be given an opportunity to develop an immunity to the uterine infection which is undoubtedly present. Many refer to low grade fever as sapremia. Watson<sup>3</sup> considers each case a potential septicemia and

\*Read at a meeting of the Pacific Coast Society of Obstetrics and Gynecology, Los Angeles, Calif., December 9, 1932.

advises against any interference with the interior of the septic uterus until we are sure that the activity of the organisms has ceased, as evidenced by normal temperature and leucocyte count.

This study includes all cases of abortion that have entered the Multnomah County Hospital, our teaching clinic, during the five years from January 1, 1927, to January 1, 1932. The term abortion as used in this discussion includes all cases of pregnancy from the earliest conception to the previable stage, or the twenty-eighth week of fetal life.

Our total number of cases was 341, which were classified as follows: threatened, 18 or 5.0 per cent; inevitable, 61 or 17.0 per cent; incomplete, 261 or 76.0 per cent; therapeutic, 1 or 0.3 per cent. In all of these cases with the exception of the last mentioned, the causative factors of the abortion occurred before the patient entered the hospital. The therapeutic abortion was done because of a decompensated heart disease which complicated the pregnancy.

Of the 341 cases, 169 or 43.6 per cent were classified as spontaneous, no information as to attempted interference with the pregnancy being obtained, while 149 or 43.0 per cent were either self-induced or were interrupted by an abortionist. In 22 instances or 6.4 per cent, the passage of an instrument or foreign body into the uterus was suspected and so recorded on the history. This estimate places induced or criminal abortions in this series at 43.6 per cent and if we add the 22 suspected cases, the total is a little more than 50.0 per cent. The patient's fear of exposure often conceals the truth regarding the etiology and there were probably many other induced abortions among those classified as spontaneous. Of the 149 induced abortions, 41 or 27.0 per cent were stated to have been performed by abortionists which included regular physicians, naturopaths, chiropractors, drugless healers, and others. In the self-induced, a great variety of means were used, the most popular being the catheter, which was resorted to in 34 instances or 31.0 per cent. Women are able to procure this dangerous weapon at many drug stores, where they are sold for abortion purposes. The slippery elm stick occupied second place as a choice of appliances with which to disturb pregnancy, being the offender in 24 or 13.0 per cent of these cases. When catheters or slippery elm sticks were not available, many other types of probes were used, such as crochet hooks, nail files, and syringe tips, and one patient used a nut cracker. Another introduced a case knife into the uterus. Among the different drugs used, quinine was the most popular. Turpentine, ergot, and numerous other medicines were also resorted to.

The average age of these patients was twenty-seven years, the greatest number, 173 or 50.0 per cent, occurring between the ages of twenty-one and thirty years. The ages ranged, however, from sixteen to forty-six years.

It is interesting to note that by far the greatest number of abortions, 278 or 81.0 per cent, occurred in married women. Of 51 who were single, 32 women had previously been married. Twelve refused this information. The number who admitted having had previous abortions was 176 or 51.6 per cent, 88 having had one, 42 two, and 27 three, the number gradually decreasing to one patient who had had eleven.

The parity of these patients also showed a wide variation, the present pregnancy being the first in only 48 instances or 14.0 per cent. Two hundred ninety-three or 86.0 per cent had had from one to eleven children. The greatest number, however, had borne from one to three babies.

The duration of pregnancy at the time the abortion occurred varied from one to twenty-eight weeks. The greatest number, 234 or 68.0 per cent, occurred between the first and the third month. Between the first and the second month there were 133 and between the second and the third month there were 101.

Pain, chills, and fever were the most common symptoms. Bleeding was present on admission in 314 patients or 92.0 per cent, and varied in amount, being described as slight in 46, moderate in 140, and profuse to the extent of hemorrhage in 122. A number of patients were badly exsanguinated at the time of admission, evidenced by the fact that 34 had an erythrocyte count below 3,000,000 and 19 had a hemoglobin below 50.0 per cent. Pain, situated in the lower abdomen, was present in 232 or 68.0 per cent. In the majority of instances it was intermittent and cramplike in character, except in those who had developed pelvic cellulitis and then the discomfort varied from a dull aching to severe pain in the pelvis.

Upon admission 128 or 37.0 per cent stated that they had had fever, while 71 or 20.0 per cent had had chills. We believe, with others, that chills indicate that the infection has spread beyond the confines of the uterus and that there is a beginning parauterine or systemic infection. Nausea and vomiting were also common complaints, and weakness was often given as one of the symptoms.

The duration of the symptoms varied from one day to four months. In 136 or 40.0 per cent, the symptoms had been present from one to fifteen days, and 41 patients stated that the symptoms started from sixteen days to one month prior to their admission to the hospital.

Upon examination, pallor of the skin was evident in many, due not only to hemorrhage but to infection and shock as well. Distention of the abdomen was rather uncommon, while tenderness was frequent, being present in 232 or 68.0 per cent. Rigidity of the rectus muscle was present in only 37 cases. A mass could be palpated in the lower abdomen in 26 patients. Tenderness of the abdomen often defeats the examiner in outlining a mass which may be present. The leucocyte count was above 10,000 in 151 patients or 44.0 per cent. Smears were positive for the gonococcus in 10 cases and the Wassermann reactions were positive in 12 others.

Of the 18 cases of threatened abortion, in 7 an attempt had been made, either by the patient or by an abortionist, to interrupt the pregnancy. Five patients showed evidence of sepsis, having fever ranging from 98.6° to 101.0° F. The leucocyte count in these patients ranged from 6000 to 19,600. In 7 cases it was above 10,000. The average total hospital days for this class was eight days. In 1 case pyelitis complicated the picture. Of the 18 patients, only 2 aborted the fetus before discharge from the hospital, but from the evidence derived from the histories it was our opinion that several may have gone on to abortion after leaving the hospital, for 5 signed their release and left against our advice. This was before we felt that they were well enough to be up, for 2 still had slight bleeding.

In making this analysis we divided our cases into two types; namely, febrile and afebrile. There were 34 or 9.7 per cent of these patients who had a normal temperature throughout their hospital stay. The leucocyte counts in 5 of these ranged from 10,000 to 17,000. Most of them recovered rapidly, the average hospital stay being but seven days. One patient in this group entered the hospital in a moribund condition as a result of hemorrhage and died within a few hours.

Of the febrile cases there were 307 or 90.3 per cent. These were divided into two groups. In the first group were those with low grade sepsis, in whom the temperature did not rise above 100.6° F. during their stay in the hospital. Of these there were 193 or 56.0 per cent. In the second group were those with frank sepsis, in whom the temperature was above 100.6° F. Of these there were 114 cases or 33.7 per cent. Of the 193 in the first group, or those with a temperature of 100.6° or lower, 98 had no leucocytosis and only a small blood loss, their recovery was

without complication, and their average stay in the hospital was eleven days. Thirty-three had no leucocytosis but showed considerable hemorrhage. Their average stay was also eleven days. Twenty-two had a leucocytosis in which the number varied from 12,000 to 34,000. The average number of hospital days for these patients was thirteen.

Of the 114 septic patients in whom the temperature was above 100.6°, 75 or 65.8 per cent followed a mild course and 39 or 34.2 per cent a severe course of illness. In the 75 first mentioned, the temperature variation was from 100.6° to 104° F. The duration of fever at this height was one day in 47 patients, two days in 23 patients, three days in 5 patients, and four days in only 1 patient. Nineteen showed marked anemia, while 25 had a leucocytosis above 10,000. They averaged twelve days in the hospital and there was no mortality. In 45 of the 75 patients there was a high temperature, ranging from 101° to 104° F., on admission, with a rapid drop to



Fig. 1.—Placenta in situ. Autopsy specimen. (Dept. Gyn. Path., Univ. of Oregon Medical School.)

normal in from twenty-four to seventy-two hours. In 24 instances this drop occurred just after the expulsion of either the fetus or the placenta.

Of the 39 patients who had a severe, prolonged course of illness, the temperature variation was from 99° to 105° with a duration of fever from five to fifty-six days. The average duration of the pregnancy at the time of abortion was two and one-third months. The abortion was induced in 20 or 51.0 per cent, interference suspected in 3 or 10.0 per cent, and said to be spontaneous in 16 or 39.0 per cent. There was an average duration of symptoms or illness for fourteen days before entrance to the hospital, which consisted chiefly of vaginal bleeding, pain, nausea, vomiting, chills, fever, and weakness. The admission temperature varied from 99° to 105° F. All were classified as incomplete abortions. The average leucocyte count was 14,000, and the average number of polymorphonuclear cells was 76.0 per cent. The sedimentation rate was markedly increased in most instances. In 3 cases blood cultures were made but none was positive. The complications noted in this

series were pelvic cellulitis in 14, pelvic abscess in 3, phlebitis in 2, and suspected thrombophlebitis in 8. Sixteen showed marked secondary anemia, having a hemoglobin below 50.0 per cent. There were two deaths in this group. The average number of hospital days was twenty-one and a half.

Postabortal infection begins within the uterus and nearly always at the placental site (Fig. 1). The bacteria concerned are numerous but



Fig. 2.—Appearance of the uterus in acute postabortive infection. Uterus is enlarged and edematous. Areas of necrosis of the walls are present.



Fig. 3.—Microscopic appearance of uterine wall as seen in Fig. 2. Round cells and leucocytes are abundant with numerous areas of degenerated myometrium.

the streptococcus is usually responsible for the deaths that occur. The gonococcus may complicate the picture. The severity of the infection depends not only upon the virulence of the infecting organism, but upon the resistance of the patient as well (Figs. 2 and 3). Curtis<sup>4</sup> has shown that a single intrauterine instrumentation is practically harmless in spite of the fact that bacteria are nearly always introduced into the endo-



metrial cavity. The low grade endometritis which is produced is very soon walled off by a protecting layer of leucocytes and usually goes on to resolution unless a second intrauterine instrumentation occurs, in



Fig. 4.—Specimen showing instrumental perforation of the uterus. Thrombosis of the uterine veins may be seen. Several areas of necrosis of the uterine wall are present.



Fig. 5.—Section through uterine wall as seen in Fig. 4, showing microscopic appearance of thrombosed blood vessels. Thrombus is of the septic type, consisting largely of leucocytes and fibrin.

which case the barrier may be broken down, thus allowing the infection to spread beyond the confines of the uterus. Postabortal infections may then assume the form of cellulitis or thrombophlebitis, or may become systemic in their character. Postabortal or postpartum infections extend outward from the endometrial cavity by the blood vessels or by the

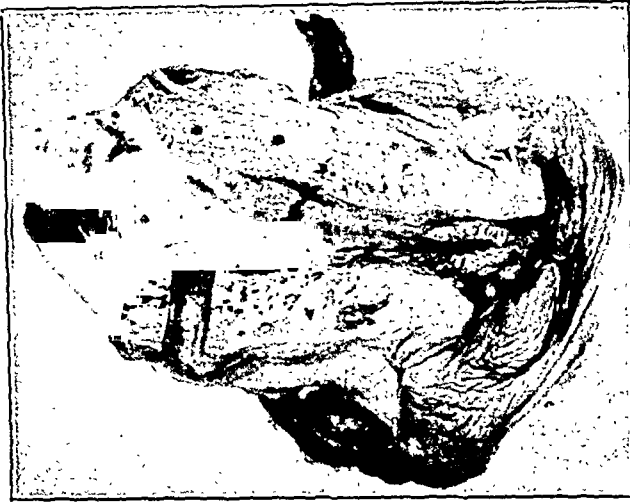


Fig. 6.—Postpartum infection of the uterus, showing multiple thrombi of the uterine wall. This patient died three weeks after delivery as a result of a hemolytic streptococcus blood stream infection.



Fig. 7.—Microscopic appearance of the uterine wall as seen in Fig. 6. Thrombi may be seen in the smaller blood vessels with edema and round cell infiltration of the myometrium.

lymphatics. The increased vascularity of the pregnant uterus with a corresponding increase in the size of the lymphatic channels allows an early dissemination of the infection. Infected thrombi of the blood

vessels of the uterine wall and broad ligament are frequently found (Figs. 4, 5, 6, 7, 8). Blood stream infection occurs early because of this. The importance of lymphatic dissemination is shown by a series of 163 postmortem examinations in postpartum and postabortal sepsis in which Halban and Koehler<sup>5</sup> found evidence of lymphatic spread in 115 cases and in 48 it was the only method of dissemination. When the infection passes through the lymphatics, it invades the cellular tissues of the broad ligament and may continue on to the serous surfaces, such as the peritoneum and pleura. Blood stream invasion in this type is late, and the organisms are thought to reach the blood through the thoracic duct. Cellular tissue infection causes the formation of exudates in these tissues, consisting largely of flocculent serum, and



Fig. 8.—Specimen showing thrombosis of the large veins of the broad ligament. Smaller thrombi may be seen in the broad ligament and in the uterine wall. (Courtesy of Dr. Frank Menne.)

at times causing a mass to rise in the abdomen to considerable height (Figs. 9 and 10). It is surprising how quickly such a tumor will disappear when the virulence of the infection subsides. Ovarian abscesses may occur and become persistent over a long period of time.

Peritonitis caused by organisms invading this cavity through the lumen of the fallopian tube is said to occur but the pathologic condition of the fallopian tubes in postabortal infections shows a perisalpingitis rather than an endosalpingitis, which would tend to support the view that unless complicated by active gonorrhea, this seldom occurs. Cul-de-sac abscesses, however, are not unusual and their origin is probably due to infection which reaches the peritoneum by direct extension through the cellular tissues, and produces a peritonitis which becomes localized at this point. Perforation of the uterus probably happens much

more frequently than we know (Figs. 4 and 5). Provided the intestine is not traumatized such injuries often go on to resolution without difficulty.

The pathologic diagnosis of tissues removed from our patients showed placental tissue and fetal structures with varying degrees of degenera-

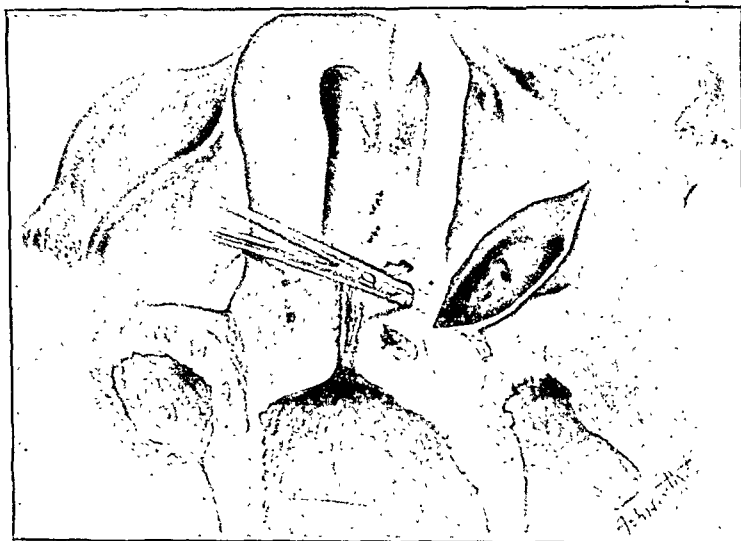


FIG. 9.—Broad ligament infection showing abscess formation (anterior view). Lymphatic type of dissemination of infection occurred in this case.

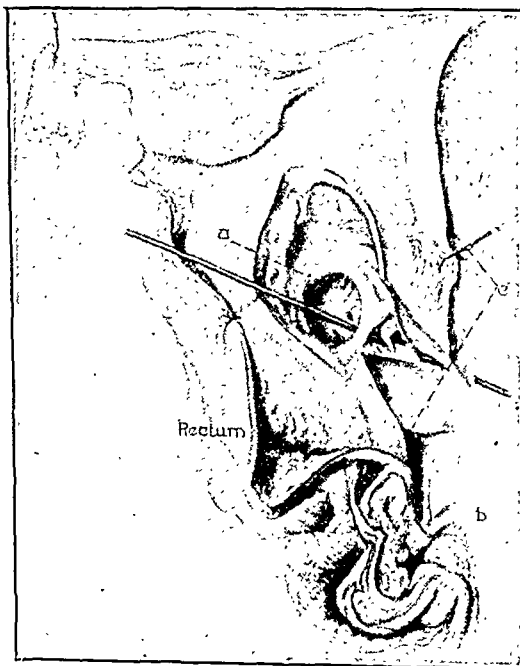


Fig. 10.—Posterior view of specimen as seen in Fig. 9. (a) Abscess cavity. (b) Rectovaginal septum showing cellulitis. (c) Lateral wall of uterus. Abscess cavity communicated with the cervical canal.

tion and infection in all instances. It is interesting to note that hydatidiform degeneration of the chorion was present in only two cases. It has been stated that this condition is present much more frequently than we suspect. Such a contention, however, is not borne out by this study.

#### TREATMENT

Ninety and three-tenths per cent of the patients in this series had a febrile course. We were therefore dealing with a septic, or potentially septic, disease of the uterus and surrounding tissues which required the strictest type of conservatism in management. Secondary anemia also added to the risk, as many of these patients had been bleeding for some time.

In the management or treatment of such patients there are two different plans advocated. One group believes in active treatment, consisting of immediate evacuation of the uterus in every febrile abortion unless perimetrial complications are present. The second group believes in conservative management, building up the patient's resistance, and waiting until the temperature has returned to normal and remained there from five to ten days, before invading the uterus. The contents are often expelled in the meantime, making its evacuation unnecessary. Only in the case of dangerous, uncontrollable hemorrhage is the rule violated. Most gynecologists in this country have adopted the latter conservative plan of treatment. Our routine orders are the following:

(1) Absolute rest in bed. (2) Provide a nourishing diet, forcing fluids, and give plenty of fresh air. (3) Elevate the head of the bed 12 inches except in severe hemorrhage. (4) Ice bag to pelvis. (5) Codeine or morphine for pain as needed. (6) No vaginal douches. (7) No vaginal examination is to be made except by the attending gynecologist or by his special order. (8) For bleeding give fluid extract of ergot,  $\frac{1}{2}$  drachm, every four hours, supplemented with pituitrin if necessary. Dangerous hemorrhage is to be controlled by special means, such as packing the uterus or removal of the placenta, if indicated. (9) Leucocyte count is to be made and sedimentation rate determined every fourth day as a guide in management. (10) No case requires surgical interference unless an abscess is pointing extra-peritoneally, such as culdesac or abdominal wall abscess. (11) It is generally agreed that five days or more of normal temperature and absence of leucocytosis, and a normal sedimentation rate are desirable before removing the remaining placenta, if such procedure is necessary. (12) Fluids, such as glucose or saline solutions, are given intravenously, subcutaneously, and rectally in the dehydrated cases or where there is need for fluid, as in hemorrhage, shock, or sepsis.

Under this routine management 225 or 66.0 per cent recovered without invading the uterus. Under general treatment, intravenous and subcutaneous glucose and saline solutions were used in many instances and proved their value, particularly in hemorrhage and shock. Fluids given by rectum were also useful. Blood transfusions were employed in 10 patients and would have been used many more times had donors been available. Their value in secondary anemia and in sepsis is generally recognized. Repeated milk injections were given in 7 patients who developed infections outside the uterus. Their usefulness, while

questioned by some, still warrants their employment in the endeavor to increase the patient's resistance.

In 36 instances hemorrhage was so marked that immediate surgical interference was necessary. In these patients the placenta was removed either by sponge forceps or by gentle curettage. Occasionally the uterus had to be packed even after the secundines were removed. Retained placenta, causing moderate bleeding, was the indication for evacuation of the uterus in 78 others. If previous curettage or instrumentation was suspected, placental remnants were removed, whenever possible, by the use of the sponge forceps alone. Every precaution was taken to avoid disturbing the barrier which had been formed in the uterus to wall off the infection. All patients subjected to curettage or evacuation of the uterus recovered and left the hospital in good condition. In no case did we invade the uterus if there was evidence of perimetrial infection. In one patient with a severe secondary anemia, abscess of the culdesac developed which required incision and drainage. The recovery was slow. During her convalescence she developed a phlebitis in one of her limbs. She was discharged after fifty-six days in the hospital. Two other patients with pelvic abscess recovered without surgical drainage.

There were 3 deaths in this series: 1 was due to acute hemorrhage and 2 were due to postabortal sepsis, making a total mortality of 0.88 per cent.

#### COMMENT

That invasion of the postabortal endometrial cavity produces an unfavorable reaction is evidenced by the fact that a rise in temperature occurred in 73 or 64.0 per cent of 113 patients in whom we did a curettage or evacuated the uterus by sponge forceps. In the majority of these patients the reaction was slight, causing an elevation of temperature of about 1°. In nine instances, however, there was a high fever following, averaging 3.2° with a duration of from two to seven days. Several of these women had a marked chill subsequent to the operation. Previous to the time of the evacuation of the uterus in the 9 patients last mentioned, 8 had normal temperature, while one with severe hemorrhage had a fever of 100.4°. While no immediate disaster happened following any case of intrauterine manipulation, perimetrial invasion by bacteria undoubtedly occurred, and the impaired future health of the patients, as a result of this, may make itself apparent in not a few instances. Curtis found virulent bacteria in the pelvic cellular tissues eighteen years following the primary infection. We are doing fewer evacuations of the uterus each year.

Another interesting finding in this group of cases was the rapid decline of temperature after the expulsion of the uterine contents. We interpreted this to be due to two factors, the first being the establish-

ment of drainage, and the second, a cessation in the absorption of toxic products of the infected and necrotic uterine contents under increased pressure. A medicinal agent which would cause the expulsion or help to expel the retained secundines, seems to be indicated in such instances.

One cannot conclude a study of this type without commenting on the incidence of criminal abortion. Women who are determined not to continue with pregnancy will resort to almost any means to interrupt it. If they cannot afford to go to an abortionist, they will try to abort themselves, using almost any method they think will be successful regardless of its danger to their lives or future health. Efforts to prevent abortions have not met with success, for there are probably more being done in the world at the present time than ever before. One effective way of preventing abortion would be the perfecting of accurate contraceptive methods with proper dissemination and use of such knowledge. It is true that many fine individuals are born each year whose conception was not planned, and such contraceptive measures might rob the world thereof; but on the other hand, the ninth, tenth, or eleventh conception of many indigent parents would be guarded against the hazard of the crochet hook or other like instrument.

#### CONCLUSIONS

1. Three hundred forty-one cases of abortion were studied with reference to their incidence, course, and the outcome of conservative management.
2. Criminal abortion occurred in 50.0 per cent of the cases.
3. Repeated abortions occurred in 45.4 per cent of all cases.
4. Eighty-one per cent occurred in married women.
5. A febrile course was followed by 90.3 per cent.
6. Hospital supervision should be insisted upon in all cases.
7. Infected patients will nearly always develop an immunity to their infection if given an opportunity.
8. The term sapremia should be discarded, as it implies a nonseptic state.
9. Hydatidiform degeneration of the chorion was present in only two instances.
10. Under conservative management, the mortality rate was 3 deaths or 0.88 per cent.
11. Contraceptive measures should be more widely taught.

#### REFERENCES

- (1) *Taussig, F. J.*: AM. J. OBST. & GYNEC. 22: 730, 1931. (2) Report made to the Oregon State Board of Health on Maternal Mortality. (3) *Watson, B. P.*: AM. J. OBST. & GYNEC. 16: 536, 1928. (4) *Curtis, A. H.*: Text Book of Gynecology, p. 46. W. B. Saunders Co., 1930. (5) *Halban and Kochler*: Quoted by Watson.

# HEMATOMETRA CERVICALIS, WITH SPECIAL REFERENCE TO PELVIC ENDOMETRIOSIS\*

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**H**EMATOMETRA, confining itself to a saccular dilatation of the cervix uteri, without corporeal involvement, is exceedingly rare. A review of the literature, regarding the accumulation of blood in the female genital tract reveals that most cases reported presented an advanced stage with massive distention of the vagina, entire uterus, and the fallopian tubes. Undoubtedly, surgical or spontaneous opening of stenosed cervixes have relieved many cases in which the cervix has been the only part involved but no instances portraying the early pathologic changes could be found in any of the reports. Not alone the rarity of the condition but, especially, the question of regurgitation of endometrium and blood in the genital tract and the bearing of the latter upon the problem of endometriosis of the pelvic peritoneum warrant the report of the case to be presented.

Pathologically, the occluding process is usually located at the external or internal os, but any position or the entire canal may have lost its epithelial lining with subsequent cohesion of the apposed granulation or connective tissue surfaces. It is generally accepted that the amassing of blood first takes place above the site of obstruction. As the blood settles or is forced to this point, the contracting uterine musculature of the corpus uteri attempts to push the blood through the obstruction. The cervix, being the weaker and noncontracting part of the uterus, undergoes dilatation. If the barrier is not complete or firm enough, small amounts of blood may escape into the vagina when the uterine contractions are strong during menstruation. If this force is sufficient, the opening may enlarge enough to permit a continuous and complete discharge of blood with each menstrual period. However, as in the case to be reported, a small amount of bleeding may occur at one or more menstruations and following this fibrous obliteration may take place during the following intermenstrual period. Dilatation of the corpus by menstrual blood takes place after cervical distention has developed. Of course, if the stenosis is at the level of the internal os corporeal involvement will take place at an earlier date. Saccular distention of the body may require a relatively short period of time as evidenced by Gellhorn's case in which the uterus was the size of a grapefruit after

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the first menstruation following the occlusion of the cervical canal by radium. Escape of the retained blood in the uterus can occur by spontaneous rupture into the vagina, which is the most frequent, but the bladder and the rectum have also been the avenue of discharge. Operative interference may immediately permit the structures to return to their normal state and pregnancy has rewarded conservative measures in women of the childbearing age. The amount of dilatation is dependent upon the duration of the condition and the amount of bleeding that accompanies each menstrual period. However, as the amount of blood increases in the uterine cavity the expansile intrauterine pressure probably decreases the amount of bleeding from the endometrium by a process of capillary compression and in addition some pressure atrophy of this layer takes place but it seems that some of the endometrium always remains. Also, this same pressure causes the uterine musculature to first hypertrophy, in order to overcome the resistance, but later atrophy of this layer permits loss of contracting power and thinning out of this layer.

The quantity and character of the blood in the uterine cavity will vary with the duration of the condition and some of the already considered factors. As much as 3 liters of fluid has been found. Mucin and lactic acid, in the absence of lactic acid bacilli, have been reported as being present in this blood. Fibrin ferment and fibrinogen are absent. Laked erythrocytes make up the major portion of the fluid. The fluid is usually sterile but infection may take place from the blood stream, intestines, or by surgical interference (Binet quoted by Frank). The infected blood is usually very odorous and may be hemorrhagic purulent, or frankly purulent.

#### CASE REPORT

Patient, white, fifty-one years of age. On Nov. 13, 1931, a large, cystic, and eroded cervix, which had been bleeding for some time was amputated by another physician. According to the hospital records, the cut surfaces were approximated with chromic catgut sutures, and a gauze packing was inserted into the vagina. In the afternoon of the same day her pulse was thready, the temperature 101.6°, and she appeared to be in shock. One liter of normal saline was given intravenously at this time. On the second postoperative day she had severe abdominal cramps, a temperature of 103.8°. The vaginal packing was removed. On the third day after the operation there was a small amount of bloody vaginal discharge. Because of the stormy postoperative course an x-ray examination of the chest was done but there was no evidence of pulmonary collapse or pneumonia. By the eleventh day, following the operation, the abdominal pain, bloody vaginal discharge, and temperature had subsided. She was discharged from the hospital on the fourteenth postoperative day.

She was symptom-free after leaving the hospital until five weeks after the operation. At this time the patient had severe pains in the lower abdomen and back of a labor-like character. Accompanying the pain was the passage of a small amount of clotted blood from the vagina for a period of two days. The same symptoms recurred on two occasions in March of 1932. In May of 1932 she bled

on the eighth and ninth and stated that she felt as though something was holding the blood back and that she had to urinate very frequently at this time.

She also stated that she had a right inguinal hernia since her last pregnancy nineteen years before.

Moderate cysto- and rectocele were present, and there was a small amount of brownish discharge in the vagina. The portio vaginalis of the cervix could not be made out, the fornices forming one continuous flush surface in which no external cervical os could be palpated with the finger or with a uterine probe. The corpus uteri was enlarged to twice its normal size, round in outline, but movable. The appendages were not enlarged or tender. A small right indirect inguinal hernia was also present.

*Operation*, May 21, 1932, by Dr. Emil Ries, consisted of anterior colporrhaphy and colpoperineoplastic for cysto- and rectocele. A well curved right half of a Pfannenstiel incision was carried through the skin and subcutaneous tissues. The right indirect inguinal hernial sac isolated, ligated, cut, and then the usual Bassini repair of the muscle and fascial layers was performed. The left half of the Pfannenstiel incision was now completed in the usual manner. On opening the peritoneum it was seen that the serosa of the exposed large and small intestines in the lower half of the abdomen was diffusely stained by dark red to purple unclotted blood. The uterus was in an anteverted position, enlarged to the size of a three and one-half months' pregnancy, moderately soft in its lower half, and no adhesions were present about the body of the uterus. The right fallopian tube, though embedded in adhesions, was patent. The right ovary was of normal size and adherent to the posterior surface of the broad ligament by thin vascular adhesions. The left tube was slightly thickened, tortuous, and adherent to the left ovary. The latter was the size of a hen's egg and adherent to the posterior surface of the broad ligament. In freeing the appendages of the left side, a 3 cm. cyst filled by chocolate colored liquid was ruptured, revealing a distinct yellow wall lining the inside of the cavity. The left infundibulopelvic ligament and the right broad ligament, close to the lateral wall of the uterus were clamped, cut and ligated. The upper portion of the uterus now being relatively free, the cervix could be identified as a saccular, rounded structure of flabby consistency that was enlarged to fully twice its normal size. The posterior surface of the cervix was firmly adherent to the anterior rectal wall by firm vascular adhesions. A complete hysterectomy was then carried out as usual and in spite of the fact that the cervix was so markedly dilated the ureters were not exposed at any time during the operation. The patient made an uneventful recovery and left the hospital two weeks after the operation.

*The uterus* (Fig. 1) on sagittal section, and not fixed in formalin, showed that the cervical portion was dilated by 44 c.c. of unclotted, thick, and deep red blood in the central portion. The inner wall of the cervix was lined by a layer of slightly adherent clotted blood up to 0.8 cm. thick. After fixation in 10 per cent formalin solution for twenty-four hours, the entire uterus measured 9.5 cm. from the fundus to the position of the external os. The width between the insertion of the tubes was 9.5 cm. The constricted portion, representing approximately the level of the internal os was 5 cm. in diameter. The greatest diameter of the dilated cervical portion was 6.8 cm. transversely and 6 cm. anteroposteriorly. The anteroposterior thickness of the corpus was 4.2 cm. The lower pole (vaginal portion) of the dilated and shell-like cervix presented a 2 and 5 mm. dimpled area, but at these points no external os could be elicited, so that there was no communication between the vagina and the blood distended cervix.

*The left fallopian tube* was 8.2 cm. long, slightly tortuous, and up to 1.1 cm. in diameter through the ampullar portion. The lumen contained a small amount of unclotted blood and was patent throughout.

*Microscopic Examination.*—Sections from the thinned out obstructing wall between the cervical cavity and the vagina including the two dimpled areas probably representing the previous site of the external os, showed markedly elongated mature connective tissue cells with marked hyalinization and no evidences of a communicating tract through the dimpled areas where the layer of connective tissue was about one-third thinner than the surrounding connective tissue wall. There were no evidences of epithelial cells lining the inner aspect nor any stratified epithelium covering the vaginal side of these two small defects.

Tissue from the lateral aspects of the dilated portion of the cervix was composed of a dense muscular and connective tissue wall. The cells of this layer were very elongated particularly in the lower one-half of the cervix. The cells lining the inner

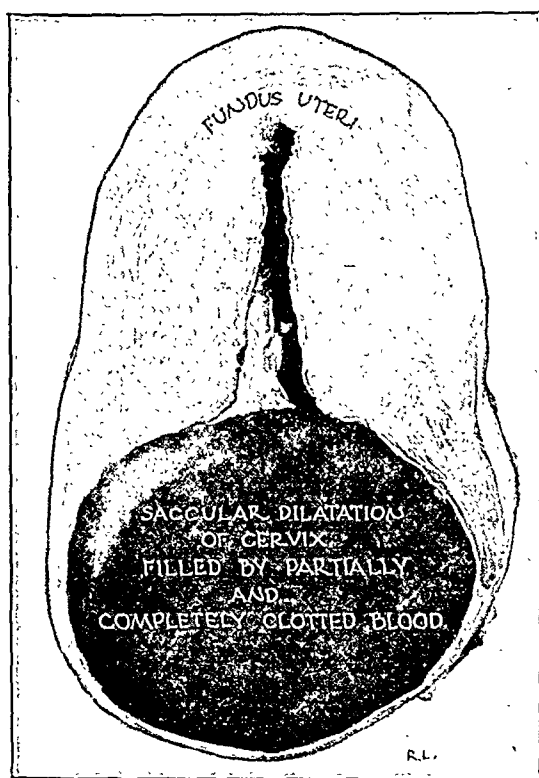


Fig. 1.—Uterus removed by hysterectomy showing markedly blood distended cervical portion and above this the enlarged and thick walled fibrotic corpus uteri.

wall of the cervix varied from a flat mucous cervical type of gland to a high cylindrical type as the region of the internal os was reached, and at the latter region the cells tended to assume the character of low folds but in no places were there any distinct glandular structures that could represent actual cervical glands. The clotted blood on the inner wall of the shell of the cervix was well organized.

Sections of the centrifuged liquid portion of the blood contained in the central portion of the dilated cervix were made up of erythrocytes in varying stages of degeneration and a few polymorphonuclear leucocytes. In addition, several small fragments of rows of surface and glandular epithelial cells containing centrally located dark staining nuclei rested on a distinct layer of connective tissue stroma (Fig. 2). These cells, with the stroma, presented all the histologic criteria of endometrium rather than the mucous cells lining the cervix.

Sections from the uterine wall including the endometrium and muscularis from the level of the internal os to the fundus of the uterus (Fig. 3). The endometrium showed the typical changes of the menstrual stage with fairly well preserved erythrocytes in the superficial layers, in the lumen of the glands, and in the cavity of the uterus. In many areas the glandular epithelium was well preserved and consisted of an intact cellular wall but in most places marked cellular disintegration

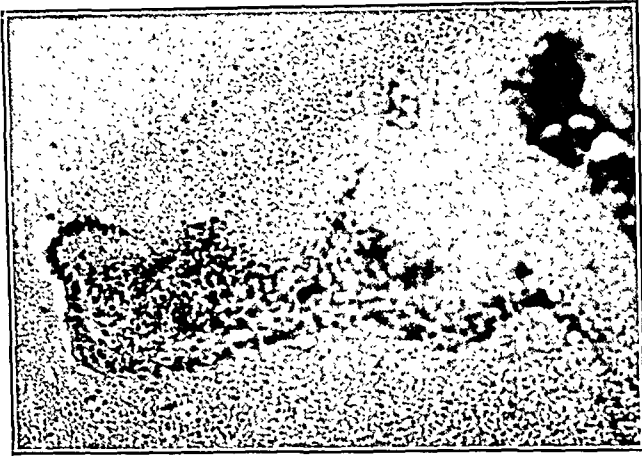


Fig. 2.—Section of centrifuged specimen of liquid portion of blood from the dilated cervix surface showing epithelium and stroma of the endometrium.



Fig. 3.—Layer of endometrium with muscularis of corpus uteri demonstrating desquamation of glandular epithelium, hemorrhage into the lumen of the glands, and into the superficial layers.

had taken place and irregular shaped pieces of glandular epithelium could be found in the lumens of the glands. The cells forming the walls of the glands were arranged in a layer two to three deep, had an indiscernible cell membrane and for the major part consisted of large nuclei that had a well-defined nuclear membrane inside of which were sparsely scattered basophilic granules. The surface epithelium of the endometrium was high cylindrical cells stained poorly with eosin, and contained large nuclei that were stippled with basophilic granules. In numerous places

the surface epithelium was completely gone and at other levels was replaced by varying sized and thick layers of red blood cells. Near the fundic portion of the uterus the muscularis was distinctly invaded by endometrial glands.

Isthmic portion of the left fallopian tube showed the lumen partially filled by masses of erythrocytes and an occasional clump of vascular connective tissue stroma which was completely surrounded by a single layer of nonciliated cylindrical cells, containing a deeply staining large nucleus. Serial sections of these clumps did not reveal any connection with the tubal folds in these areas. The subserosa of the uterine horn was thickened by a fibrillar connective tissue network that contained numerous dilated capillaries but no structures resembling endometrial tissue.

Ampullar portion of the same tube, at different levels, demonstrated varying quantities of blood within the lumen and occasional clumps of epithelium that, microscopically, corresponded to the surface epithelium lining the endometrium of the uterine cavity (Fig. 4). The tubal folds were lined by moderately high cylindrical epithelium with distinct cilia and contained moderate sized and densely

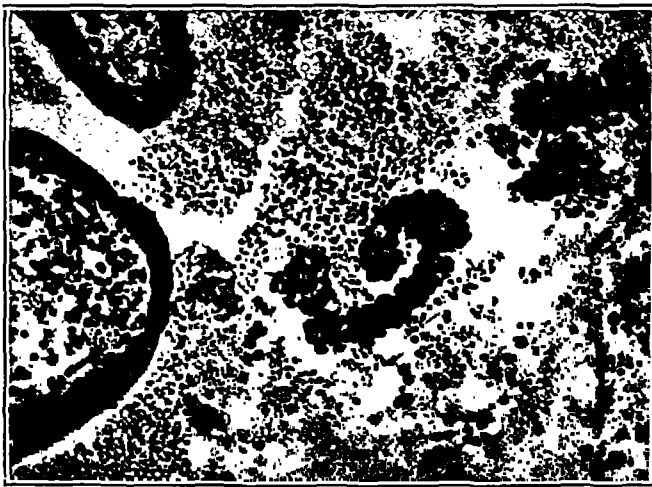


Fig. 4.—Section through ampullar portion of the fallopian tube showing well-preserved erythrocytes and a clump of nonciliated epithelium in the lumen.

stained nuclei located in the basal portion of the cell. The stroma of the folds consisted of markedly dilated and engorged capillaries and in the extravascular spaces were lymphocytes and connective tissue cells. In many places cleft-like ingrowths extended into the circular muscle bundles forming diverticula. The subserosa in this portion of the tube showed marked vascularity with numerous large and engorged capillaries almost presenting a picture of hemangiomatosis. The serosa was covered by a dense fibrillar connective tissue network in which were many thin-walled blood vessels and numerous cystic spaces of varying size that were lined by flat epithelium. These peritoneal cysts were free from blood and in several areas they opened as channels through the superficial muscle fibers of the tube and the deepest portions formed small nodules made up of the same type, but slightly expanded peritoneal cell. These nodules and cysts as described by Ries in 1896 in no way simulate dilated endometrial spaces such as has been so frequently described in endometrial implants. *Serial sections of the posterior surface of the uterus including the area where the uterus was adherent to the anterior wall of the rectum, demonstrate a thin outer layer of erythrocytes below the flat peritoneal cells and in this thin stratum were a moderate number of engorged capillaries. The ad-*

hesions seen on gross examination were, for the most part, composed of markedly hyalinized connective tissue, in the meshes of which were numerous engorged thin-walled blood vessels and free, well-preserved erythrocytes enmeshed in the fibrillar connective tissue strands. In no place could any epithelial cells be found and above all certainly no structure that could be regarded as endometrial elements.

#### COMMENT

To consider the possible cause or causes of stenosis of the cervix in this case involves considerable theoretical discussion when we take into account that the specimen represents a process that has been going on for a period of six months following the plastic operation on the cervix. Nevertheless, several facts are evident from the hospital records. We do know that the patient's postoperative course was characterized by a high temperature and a bloody, purulent discharge from the vagina. In the absence of any other findings to account for the temperature, sweats and abdominal pain the most likely focus would be in the cervix of the uterus. It is possible that the newly formed os may have been sutured partially or completely shut. The records do not state that a probe was introduced at the end of the operation to test the patency of the canal. That complete occlusion of the cervical canal did not occur is evident in that she bled from the vagina on several instances following the operation. Her menstrual irregularity after the operation is more logically explained by her menopausal-age rather than any mechanical factor produced by the condition.

In most cases of hematometra the distention by blood involves the entire uterus but in this specimen the cervix alone was the part involved. Of course, if the hysterectomy had been performed at a later date then the body of the uterus would probably have been involved. The mechanical factors, as to why the cervix was the only part involved, are of interest in this particular case. The local devitalizing effect of an operative procedure with sloughing of cervical tissue and placing of deep sutures, to control possible bleeding, would naturally offer relatively little resistance to the intracervical pressure if the outlet or os was closed by organizing blood or granulation tissue or if the os had been sutured shut. The five weeks after the operation, during which time the patient did not menstruate, would be adequate time for this occluding process to take place. The body of the uterus was not involved in the dilatation not alone because of the time element but also the firm, fibromuscular thick wall of the uterus offered greater resistance than the small remaining and less resistant cervical portion. Microscopic examination of the dilated cervix revealed no underlying pathologic condition, such as carcinoma, that would tend to make its wall still weaker.

The findings in this case indicate that reflux of blood and epithelial structures took place from the endometrium into the uterine and cervical

cavities, into the tubes, and into the free abdominal cavity. Realizing that the bleeding and desquamation of the epithelium could have been from the tube rather than from the endometrium, most of the evidence tends to bear out the regurgitation theory. First, the blood in the cervical and uterine cavities, in the tubes, and on the peritoneum was typically menstrual blood. Second, the finding of epithelial structures in the cervical blood, lining the uterine cavity, and in the lumen of the tube that corresponded, histologically, to sloughed off endometrium indicates as the source, the uterus rather than the tubal wall.

If Sampson's theory of regurgitation of blood is applied to this case, the specimen is an ideal one as far as the findings regarding the possibility of reflux of blood are concerned, whether the free epithelium in the lumen of the tube is regarded as uterine or as metaplastic epithelium of the tubal wall. So far, the theory is supported by the specimen. Beyond this, though, the findings demonstrate an opportunity for pelvic endometrial implants. Nevertheless the second half of the theory finds no support. However, several other factors have to be considered as to why endometrial tissue was not found on careful examination, in the specimens that were obtained. Although the epithelium in the uterus, cervix, and tube was histologically healthy it does not follow, that functionally, it was normal. If it did lodge on the pelvic peritoneum it may have been so old that it could not grow on a relatively infertile tissue such as the peritoneum. Also, the finding of epithelium in the locations described does not necessarily mean that the same structures also gained access to the pelvic peritoneum. We can only assume that implantation should have occurred especially when we consider that the process has been repeatedly described under less ideal conditions. Another possible reason as to why implantation did not happen is that the time after the operation was relatively short and if the obstruction would have been permitted to go on for a longer period of time there would have been opportunity for more tissue to have lodged on the peritoneum thereby increasing the chances of at least some of the pieces growing, and carrying on their cyclic changes. Lastly, in a woman fifty-one years of age the question of inadequate hormonal stimulation for the growth of this epithelium may have considerable bearing upon the viability of the misplaced cells.

From the standpoint of treatment the case elicits many possibilities regarding the prevention and active therapy of stenosis of the cervix uteri, hematometra, and hematosalpinx. If the causative factors mentioned in the first part of the article are kept in mind the cervical canal can be kept open by periodic dilatation during the period of granulation and connective tissue proliferation and contraction. After a plastic operation on the cervix, of course, the patency of the canal should be tested with a probe, if there is any doubt as to its patency. That cau-

terization of the cervix will lead to many strictures is hardly to be expected, particularly if periodic cervical patency tests are done. In addition the canal itself is not burned extensively by most general practitioners. Moreover, fewer amputations will be done thus eliminating a good percentage of the postoperative strictures. To prevent stenosis following operation, accurate coaptation of the proper edges should be as carefully done as in surgery of any other part of the body, and the same principles hold regarding the position and the proper tightness of the sutures in order to have as little sloughing and devitalization of tissues as is possible. The occurrence of stricture, as in this case, should be suspected earlier than six months after operation in order that the most conservative procedure can be carried out before extensive secondary changes have taken place.

In former years surgical opening of the occluded cervix was regarded as dangerous because of the possibility of extensive infection in the fertile blood media of the uterus and the fallopian tubes. Today, in spite of more aseptic surgery, and the risk of carrying infection by surgical interference must be kept constantly in mind and in addition exceptional preoperative antiseptic measures should be resorted to in order to avoid introducing infection into this blood filled tract.

If bimanual examination elicits the presence of hematosalpinx, the possibility of an internal hemorrhage must be considered, since the sudden collapse of the uterus after blood has been released into the vagina may tear the blood distended and friable tubes.

In a patient the age of the one here reported and in whom the question of a carcinoma of the remaining portion of the cervix cannot be ruled out a complete hysterectomy offers the easiest and most certain way out of the difficulty.

If it is desired to preserve the uterus, then we are presented with the problem of preventing infection in the retained blood, opening the strictured portion of the cervical canal, keeping it open, and restoring the involved structures to as near a normal state as possible. If simple perforation at the suspected site of the os does not lead to the cervical canal, then it may be necessary to split the anterior lip of the cervix in its longitudinal axis until the cervical canal is reached, and then amputate the cervix at this level.

Failure to open the cervical canal from the vagina is adequate reason to perform a laparotomy. The methods usually resorted to have consisted in doing a hysterotomy and then attempting to pass a probe or dilator from above into the vagina. Also, the entire length of the anterior surface of the cervix may be exposed, incised transversely until the cervical canal is reached, and at this point an attempt made to pass a probe by way of the vagina through the external os to the transverse incision. Another probe may then be inserted through the hysterotomy



opening, through the internal os, and then out of the incision in the cervix, thus creating a continuous channel that can be dilated and packed with gauze.

Stomatoplastic operations may be required for hematosalpinx if the structures are to return to as normal a state as is possible.

Gellhorn reported one case of hematometra in a women beyond the menopause following radium treatment for carcinoma of the cervix that returned to normal after seven intramuscular injections of milk.

#### CONCLUSIONS

1. The study of a case of postoperative stenosis of the cervix uteri with hematometra confined to the cervix is presented.

2. The finding of free menstrual-like blood and endometrium in the cervix, corpus uteri, and the fallopian tubes confirms Sampson's theory of the regurgitation of menstrual blood.

3. Although free blood was present in the abdominal cavity, there were no evidences of endometrial transplants or growths on the structures removed by complete hysterectomy and left salpingectomy.

#### REFERENCES

- Andrews, H. J.*: Obst. et Gynec. Brit. Emp. 19: 521, 1911. *Bell, W. B.*: Lancet 1: 1269, 1911. *Bishop, E.*: S. Clin. North America 7: 811, 1927. *Brindeau, M. A.*: Bull. Soc. d'Obst. et Gynec. 15: 555, 1926. *Child, C. G.*: AM. J. OBST. & GYNEC. 74: 484, 1916. *Cooke, W. R.*: Am. J. Surg. 8: 399, 1930. *Cross, W. W.*: Calif. & West. Med. 23: 1178, 1925. *Eastman, N. J.*: AM. J. OBST. & GYNEC. 11: 500, 1926. *Feiner, D.*: AM. J. OBST. & GYNEC. 9: 544, 1925. *Feuchtwanger, J.*: Zentralbl. f. Gynäk. 50: 1920, 1926. *Frank, R. T.*: Gynec. & Obst., Mono. D. Appleton & Co. 12: 497, 1931. *Fuld, S.*: Arch. f. Gynäk. 34: 191, 1889. *Gellhorn, G.*: Surg. Gynec. Obst. 24: 37, 1917. *Gluck, E.*: Ziegler's Beitr. 81: 121, 1928-1929. *Hall, J. N.*: J. A. M. A. 67: 1040, 1916. *Hartill, J.*: Brit. M. J. 1: 71, 1910. *Hirsch, D. I.*: New Orleans Med. & S. J. 80: 167, 1927. *Linton, A. P.*: Brit. M. J. 1: 568, 1926. *Leonard, V. N.*: Surg. Gynec. Obst. 16: 390, 1913. *Loebel, H.*: Zentralbl. f. Gynäk. 50: 1965, 1926. *Magid, M. O.*: AM. J. OBST. & GYNEC. 14: 371, 1927. *Mathiew, A., and Schauffler*: AM. J. OBST. & GYNEC. 16: 25, 1928. *Muller, P.*: Zentralbl. f. Gynäk. 50: 1919, 1926. *Novak, E.*: Gynec. & Obst. Mono. 2: 185: 1931. *Pemberton, F. A.*: AM. J. OBST. & GYNEC. 8: 605, 1924. *Rawls, R. M.*: AM. J. OBST. & GYNEC. 3: 1, 1922. *Savage, E.*: J. Obst. & Gynec. 61: 108, 1910. *Spaulding, C.*: Internat. Clin. 4: 245, 1918. *Stein, A.*: AM. J. OBST. 61: 107, 1910. *Sturmdorf, A.*: Surg. Gynec. Obst. 22: 42, 1916. *Wolff, F.*: Zentralbl. f. Gynäk. 50: 1247, 1926.

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## NEPHRITIS IN PREGNANCY\*

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OF THE various forms of toxemia appearing during the latter part of gestation, eclampsia has undoubtedly received the most attention, study, and speculation. This is not to be wondered at, as the mystery surrounding its etiology and the contradictory methods proposed for its treatment are intriguing. As a consequence, the other forms of toxemia, low reserve kidney, preeclampsia, and nephritis, have been somewhat neglected. This is particularly true in the case of nephritis complicating pregnancy. By many, nephritis is regarded as of lesser importance than eclampsia or even preeclampsia.

It is perhaps advisable that I state here what is understood by the term "nephritis complicating pregnancy." By it we mean that the patient, now pregnant, has a nephritis which may have been the outcome of some infection, such as tonsillitis, of an infectious disease, such as scarlet fever, or of some other condition, perhaps even repeated pregnancies, which resulted in permanent renal damage. In other words, the term implies a pregnancy superimposed on, or in the face of, permanently damaged kidneys, usually in the form of a chronic nephritis. This condition is absolutely distinct and different from low reserve kidney or eclampsia and preeclampsia. The kidneys are not damaged in "low reserve kidney" nor in eclampsia and preeclampsia.

What has confused many writers is that eclampsia may result in damaged kidneys, just as we see in certain cases of scarlet fever. A study of kidney function in a large series of eclamptic patients has convinced me that eclampsia, and therefore also preeclampsia, occur in patients with normal kidneys many times more frequently than in patients suffering from any form of nephritis. Nephritis plays no rôle in the etiology of eclampsia. In about one-fifth of eclamptic patients, the kidneys may become permanently damaged as a result of the eclampsia, just as they may in scarlet fever; but we do not suppose for a moment that the nephritis is an etiologic factor in the production of scarlet fever; nor should we, therefore, do so in the case of eclampsia.

Low reserve kidney does not eventuate in damaged kidneys or chronic nephritis. I have elsewhere shown that it is a very mild form of toxemia, which always clears up with proper rest in bed and diet or with delivery. In this type of toxemia, the kidney function as shown by renal function tests, is not decreased below the lower limits of normal.

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It can be clearly seen then that low reserve kidney, eclampsia and pre-eclampsia (which is only a forerunner of eclampsia and is liable to eventuate in eclampsia) are very distinct entities from nephritis. Furthermore, nephritis, in any form, plays no rôle in the production or causation of low reserve kidney or eclampsia and preeclampsia.

In our annual maternal mortality statistics; it is usually stated that infection, hemorrhage, and toxemia are the main contributing factors, while eclampsia is given as the most serious type of toxemia concerned, due to its high accompanying maternal and fetal mortality. Such statistics do not represent the true state of affairs, in that only the deaths during and immediately following pregnancy are considered; and even then the victims of nephritis often outnumber those of eclampsia. Should our annual statistics include a ten-year mortality figure, nephritis would, in my opinion, be the second greatest factor in this death rate, being surpassed only by infection.

That we have every reason to believe in this prediction is indicated by a recent follow-up study of a large series of pregnant patients in whom the diagnosis of nephritis was established.<sup>1</sup> This study extended over a ten-year period following the first intimation of nephritis in each patient. Over 40 per cent of these women died within ten years following the definite recognition of nephritis during their pregnant state. Although nephritis, according to the vital statistics of the United States for the year 1931, was the second largest cause of death, the ten-year mortality rate for women, during the ages of eighteen to forty, suffering from some or other form of nephritis uncomplicated at any time by pregnancy, is decidedly below 40 per cent, according to the best insurance company and medical statistics. Pregnancy itself, therefore, hastens death and increases its rate in women suffering from renal disease. Furthermore, it may even be that pregnancy itself plays an etiologic rôle in certain of the nephritides. We come to the conclusion that pregnancy and nephritis constitute a most formidable alliance, and one which results in many early and unsuspected deaths, which are often not known to the obstetrician.

It is, therefore, apparent that nephritis, in a woman who is pregnant, must be recognized as early as possible and the proper treatment or procedure instituted, if we are to materially lower this ten-year maternal mortality rate of 40 per cent incident to "nephritis complicating pregnancy." The diagnosis of chronic nephritis is not always easy nor even possible at a certain stage of the disease. Where the diagnosis is exceedingly simple, the process is often beyond help or repair and the patient is doomed. It is in the milder or earlier forms of the disease that proper treatment may greatly prolong life; and so my plea is for early recognition of the disease and correct treatment.

How then shall we know that the patient is suffering from a mild chronic nephritis? Fortunately, the disease is usually accompanied by

a hypertension and an albuminuria, which should serve as indications for detailed observation and study. In the prenatal care it is our duty to study every woman who shows a blood pressure of 140/90 or higher, with or without albuminuria, with an aim to conclusively rule out or establish the diagnosis of nephritis. This can often not be done unless the patient is admitted to a hospital where adequate kidney function studies may be carried out.

There are many aids in the diagnosis, and often it takes several of these to show us the right path. A careful perusal of the patient's past history, especially where there have been previous pregnancies, the presence or absence of symptoms, such as headache, dizziness, or visual disturbances, the presence or absence of edema and the response of the patient to rest in bed and proper diet, are all essential steps in such a study. Often a simple ophthalmologic examination of the eyegrounds clears up a confusion in this study.

It is usually necessary to admit the patient to the hospital in order that a correct diagnosis may be established. Our procedure is to put the patient on a low protein, soft diet and to plot daily the systolic and diastolic blood pressures, as well as the amount of albuminuria. This is continued for a period of about two weeks, and during this time the blood chemistry and renal function are carefully investigated. In the milder forms of chronic nephritis, the blood chemistry will usually reveal nothing abnormal. In the severer forms, a beginning nitrogenous retention is often present, as evidenced by a nonprotein nitrogen content of about 40 mg. or more in 100 c.c. of blood. Such a mild retention of nitrogen in the blood stream is usually pathognomonic of chronic nephritis. The only other types of toxemia in which we may see an increase in the nonprotein nitrogen are vomiting of pregnancy with marked dehydration and consequently concentration of the blood, and in the later stages of certain cases of eclampsia where the so-called eclamptic "toxin," whatever that may be, in other words, the disease itself, has produced injury to the kidneys with resulting nitrogenous retention. But in the case of a woman in the last three months of pregnancy who is suffering from a hypertension and albuminuria and who, in addition, reveals nitrogenous retention in the blood stream, one can be fairly sure that one is dealing with chronic nephritis. In low reserve kidney and in preeclampsia, we do not have an increase above normal in the nonprotein nitrogen of the blood nor in the urea nitrogen. The outstanding feature then, as far as the blood chemistry is concerned, in cases of chronic nephritis, is that the majority of the patients show no abnormality, while a certain number reveal nitrogenous retention, and in these, the diagnosis can almost be established on the basis of the blood chemistry.

A study of the renal function tests is most essential in the differential diagnosis between chronic nephritis, low reserve kidney, and eclampsia.

The renal function in the latter two forms is normal, while in chronic nephritis, a decreased kidney function will be found if we are patient and persistent enough in studying the patient. A single renal function test is of no value. It is often necessary to do three or four types of kidney function tests and to repeat these two or three times. We are, at present, employing three kidney function tests routinely on all patients in whom we suspect chronic nephritis. These are: the fifteen-minute phenolsulphonephthalein, the creatinine excretion, and the urea clearance tests. It is often seen that two of these tests may be normal, while one shows decreased function. In the more severe cases, all three tests may reveal lowered renal function. There is some doubt as to whether the creatinine excretion test is a true index of glomerular function, and it may be that this test actually measures tubular function.<sup>2</sup> I am convinced, however, that the fifteen-minute phenolsulphonephthalein test and the urea clearance test are of the greatest help in establishing a diagnosis.<sup>3</sup> I may say that whereas we have usually regarded a urea clearance of below 70 per cent of the normal as an index of nephritis or damaged kidneys, our ideas have recently been slightly revised as the result of the publication by Mosenthal.<sup>4</sup> Any urea clearance which gives values below 50 per cent is very strong proof of the existence of a chronic nephritis. A urea clearance above 50 per cent does not necessarily mean that the patient does not have chronic nephritis, and in these cases it is necessary to study the patient further and to repeat the kidney function tests in order to be absolutely sure that we are dealing with a nonnephritic type of toxemia. The phenolsulphonephthalein test, plotted on a fifteen-minute excretion basis, is perhaps not so sensitive as the urea clearance, but it is often of great help in establishing a definite diagnosis. A repeatedly low phenolsulphonephthalein excretion test is sure evidence of damaged kidneys. The details of these two tests, on which we depend so greatly, are as follows, according to our routine procedures:

*I. Phenolsulphonephthalein Test.—*

1. Patient has a rubber catheter inserted and bladder emptied. Leave catheter in for all of the test if used.
  - a. Fasten catheter to patient's leg with adhesive to hold in place.
  - b. Use Kelly clamp to clamp off catheter.
2. Empty bladder. Patient now drinks 200 c.c. of water.
3. 6 mg. of phenolsulphonephthalein is given intravenously by the doctor. Time ordered by the doctor.
4. 15 minutes after the intravenous injection is given by the doctor, the first specimen is obtained. Send all of the specimen to the Laboratory, marking bottles properly. Patient now drinks 100 c.c. of water.
5. 15 minutes later second specimen collected. Entire specimen is sent to Laboratory, properly labeled. Patient now drinks 100 c.c. of water.
6. 15 minutes later third specimen is collected. The entire specimen, properly labeled, is sent to Laboratory. Patient now drinks 100 c.c. of water.

7. 15 minutes later fourth specimen is collected. Entire specimen, properly labeled, is sent to Laboratory. Patient now drinks 100 c.c. of water.
8. 15 minutes later fifth specimen is collected. Entire specimen, properly labeled, is sent to Laboratory.
9. 15 minutes later sixth specimen is collected. Entire specimen, properly labeled, is sent to Laboratory.
10. 15 minutes later seventh specimen is collected. Entire specimen, properly labeled, is sent to Laboratory.
11. 15 minutes later eighth specimen is collected. Entire specimen, properly labeled, is sent to Laboratory.

## II. *Urea Clearance Test.*—

1. 6 A.M. awaken patient. Regular breakfast, except tea, coffee, or cocoa. See that patient stays awake.
2. 7 A.M. patient voids, specimen discarded. Patient may have 200 c.c. of water.
3. 8 A.M. patient voids, entire specimen is to be sent to Laboratory. Patient may have 200 c.c. of water.
4. 8:30 A.M. Blood drawn by the doctor. Doctor to fill in label and mark bottle or tube.
5. 9 A.M. patient voids, entire specimen is to be sent to Laboratory. Patient may have 200 c.c. of water.
6. Patient may have food.

Points to be emphasized are that, before beginning the phenolsulphonaphthalein test, one should be sure that all bottles are properly labeled with the number of the specimen, first, second, third, fourth, fifth, sixth, seventh, and eighth, and the correct time collected. We have found this very essential to the correct conductance of the test. It is also well to check with the doctor to see if he wishes the patient to have a catheter inserted or to have all specimens voided. The patient may have food during the test.

The third test on which we place reliance, although to a somewhat lesser extent than on the other two outlined above, is the creatinine excretion devised by Major. In this test the patient is given one-half of a gram of creatinine intramuscularly and the rate of excretion observed. The details of the test, as carried out in the Woman's Clinic of the New York Hospital, are as follows:

1. 8:15 A.M. sharp. Breakfast is served from floor service.
2. 9:15 A.M. patient voids, specimen discarded. Patient may have 200 c.c. of water.
3. 10:15 A.M. patient voids, entire specimen is to be sent to Laboratory. At this time,  $\frac{1}{2}$  gm. of creatinine is given by the doctor.
4. 11:15 A.M. patient voids, entire specimen sent to Laboratory. Patient may have 200 c.c. of water.
5. 12:15 patient voids, entire specimen is sent to Laboratory.

The results of the phenolsulphonaphthalein test are plotted on a curve as shown in Fig. 1. Decreased kidney function is readily observed as the patient's course does not follow the normal curve which is printed on all our kidney function charts.

The urea clearance is readily figured out by the formula:

$$C_m = \frac{U \times V}{B} \times 1.33$$

where  $C_m$  = Maximum clearance  
 $U$  = Urea nitrogen per 100 c.c. urine (either specimen)  
 $V$  = Volume of urine per minute  
 $B$  = Blood urea nitrogen per 100 c.c. blood.

The maximum clearance ( $C_m$ ) is calculated when the amount of urine excreted is 2 c.c. or more per minute, and represents the percentage of

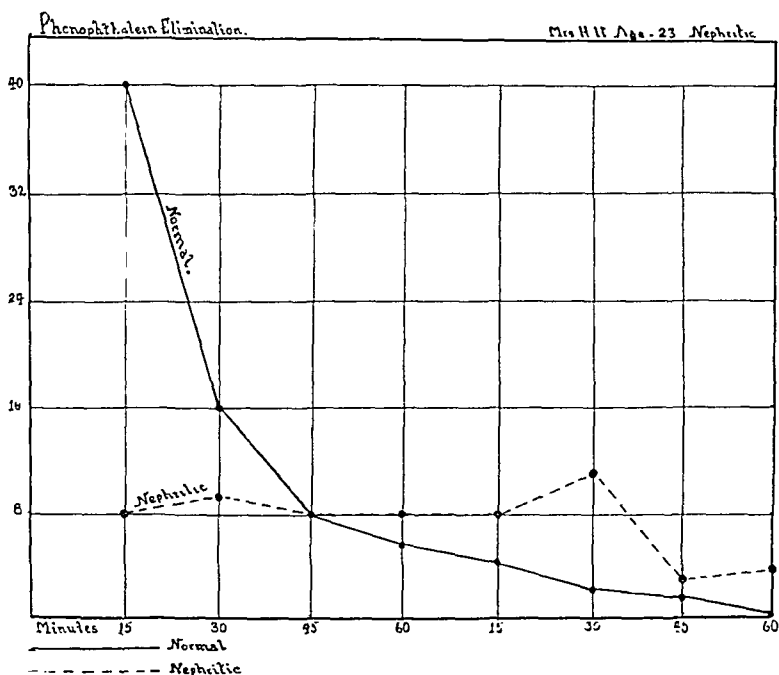


Fig. 1.

normal. When the urine excreted is less than 2 c.c. per minute, one calculates the standard clearance ( $C_s$ ) according to the formula:

$$C_s = \frac{U \times \sqrt{V}}{B} \times 1.85$$

The standard clearance ( $C_s$ ) is also expressed, according to the above formula, as a percentage of normal. The basis for the above formulas is that in one minute 75 c.c. of blood is normally cleared of urea by the kidneys when the amount of urine voided is 2 c.c. or more per minute, while 54 c.c. of blood is cleared if the rate of urine excretion is less than 2 c.c. per minute. The comparison of normal and decreased urea clearances is graphically shown in Fig. 3.

The basis of the creatinine excretion test is that the person with undamaged kidneys excretes during the first hour after the injection of  $\frac{1}{2}$  gm. of creatinine three times or more creatinine than during the hour preceding the injection. The creatinine excretion curves for normal and nephritic patients are shown in Fig. 2.

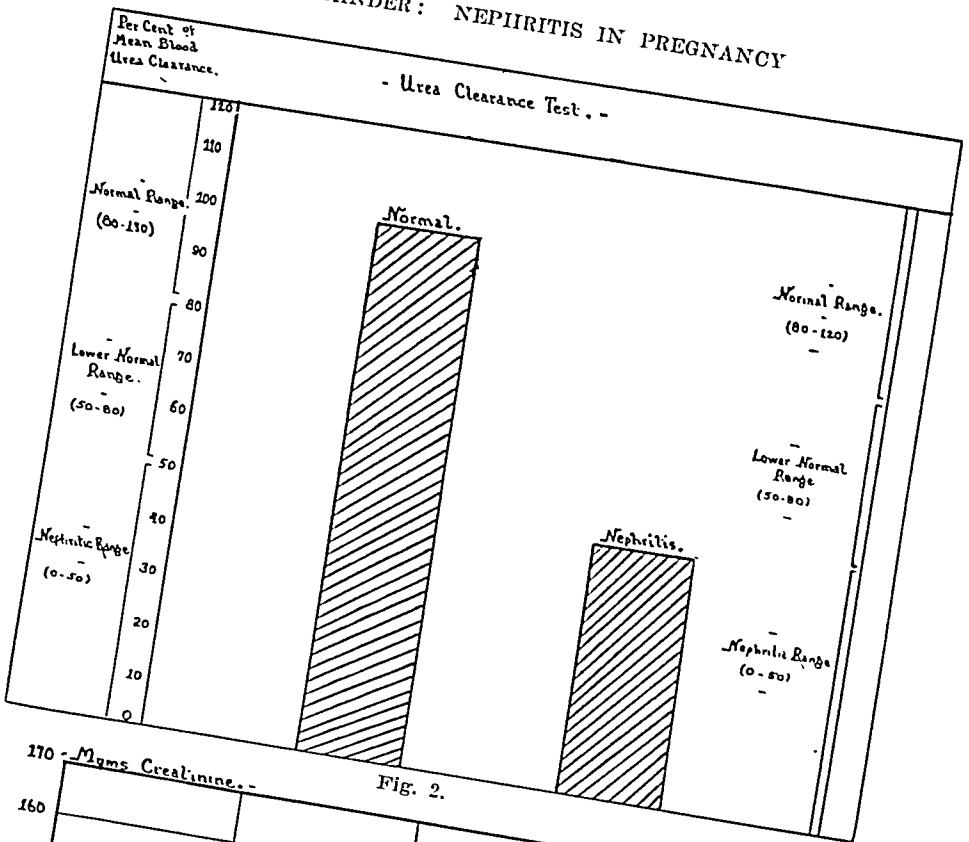
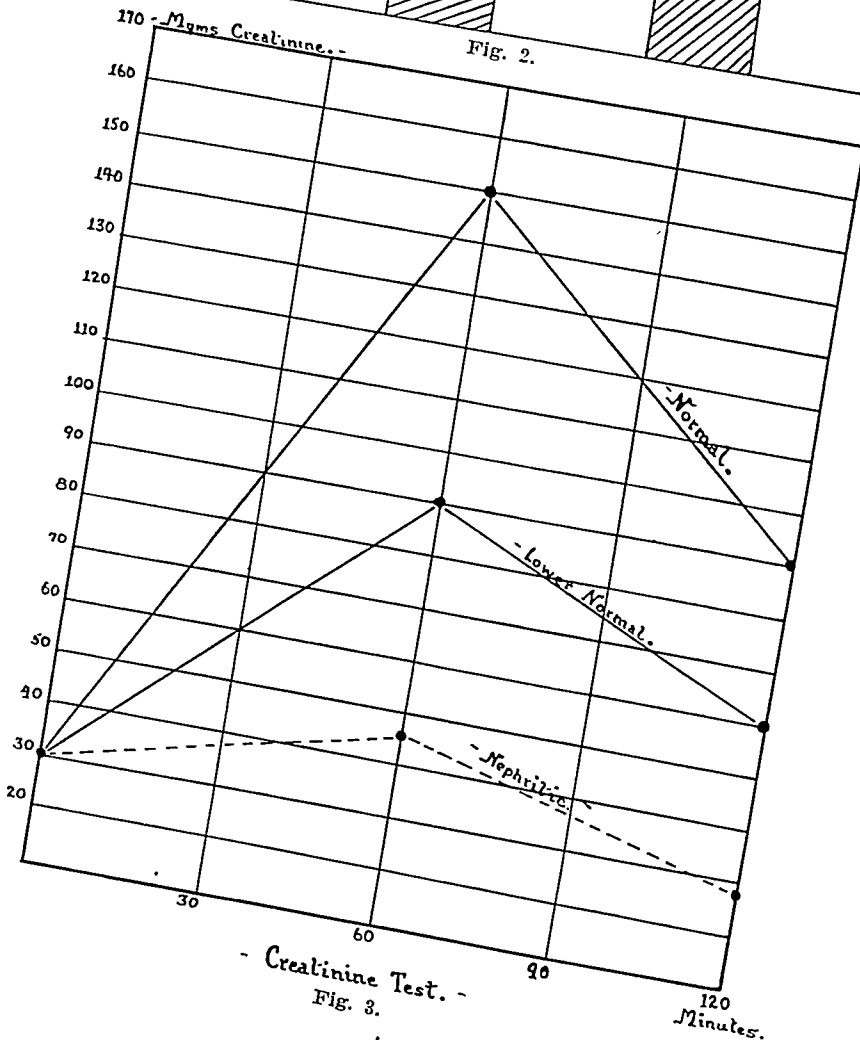


Fig. 2.





The Addis' cell count is of further value. My experience with cell count has been limited, and I am as yet not in a position to make any definite statement regarding this method of recognizing an underlying nephritis. The microscopic examination of the urine is not of great help in the average case in whom a differential diagnosis is difficult to establish.

The patient's past history, the hypertension, albuminuria, and edema and their response to rest in bed under proper dietary measures, the examination of the eyegrounds, the presence or absence of symptoms and their response to hospitalization, the repeated study of the blood and urine chemistry, the repeated study of at least two kidney function tests such as the fifteen-minute phenolsulphonephthalein and the urea clearance, and the period of pregnancy when hypertension, albuminuria, and symptoms first appeared are the main factors in our differential diagnosis. If one studies these points carefully, and it usually takes two weeks to do so, there are very few cases indeed in whom one is unable to establish a diagnosis.

My views about the treatment of nephritis, as appearing during pregnancy, have undergone very radical changes. I used to advocate fairly conservative measures. Today I am more radical, and this change in my views is due to the results seen in the follow-up study to which I have referred earlier in this paper. In face of a maternal mortality of over 40 per cent, when this mortality is calculated on a ten-year basis, I feel that radical measures are indicated. In a patient in whom a definite diagnosis of chronic nephritis is firmly established, I do not hesitate to advocate termination of the pregnancy, taking into account, of course, all other factors which should be considered. We know that pregnancy as it proceeds toward term throws a greater and greater load on the kidneys and undoubtedly shortens the lives of patients with an underlying damaged renal condition. In such patients, termination of the pregnancy seems to be the procedure of choice. If the patient is near term and the child is living, I usually advocate cesarean section with sterilization, as experience with birth control procedures has taught me that we cannot depend very greatly on this measure of preventing future pregnancies. If the chronic nephritis is quite severe, I go so far as to advocate sterilization by hysterectomy rather than by tubal resection, as I feel that the involution of the uterus and the excretion of all its concomitant break-down products will throw a further load on the already damaged kidneys. It is, of course, necessary in such cases to obtain the consent of the patient, as there are women who wish to continue menstruation. It is not my practice to be as radical as this in all patients, as each case has to be studied individually, and I can outline here only my underlying principles in treatment. We feel convinced that chronic nephritis and pregnancy form an exceedingly serious combination, and wherever it is possible, the pregnancy should be terminated

as soon as is advisable in order that the chronic nephritis be not further aggravated and the patient's life thereby markedly shortened.

### CONCLUSIONS

1. The prognosis in chronic nephritis complicated by pregnancy is grave, the average maternal mortality occurring within ten years being approximately 40 per cent.

2. It is our belief that the strain of pregnancy on kidney function greatly aggravates an underlying chronic nephritis, and thereby materially shortens the life of the individual.

3. To help in the early recognition of nephritis we advocate the employment of the urea clearance and fifteen-minute phenolsulphonephthalein tests. The creatinine excretion test may also be employed, although it perhaps measures tubular instead of glomerular function.

4. In addition to these kidney function tests, the patient's past history, the duration of pregnancy, the behavior of the blood pressure, albuminuria, and edema under hospitalization with proper dietary measures, the examination of the eyegrounds, the cardiovascular system, and the findings in the blood and urine chemistry, are all aids in establishing a correct diagnosis.

5. The best treatment for chronic nephritis in a pregnant woman is the termination of the pregnancy and prevention of any further pregnancy.

### REFERENCES

- (1) *Stander, H. J., and Peckham, C. H.*: AM. J. OBST. & GYNEC. 22: 626, 1931.  
(2) *Shannon, J. A., Jolliffe, N., and Smith, H. W.*: Am. J. Physiol. 102: 534, 1932. (3) *Stander, H. J., Ashton, P., and Cadden, J. F.*: AM. J. OBST. & GYNEC. 23: 461, 1932. (4) *Bruger, M., and Mosenthal, H. O.*: Arch. Int. Med. 50: 544, 1932.

### DISCUSSION

DR. J. O. ARNOLD.—Most of us will undoubtedly agree with almost all that Dr. Stander has said, though, perhaps, not all, especially on the matter of the radical conclusions as to treatment.

Like Dr. Stander, I, too, have definitely changed my views on this point, in the past three years, but my change has been in exactly the opposite direction. My experience with this class of cases in recent years, has given me reason, I believe, to be less radical than formerly. Until about three years ago, I unhesitatingly accepted and acted upon the conclusion that pregnancy should be prevented or terminated at an early date, in patients with known nephritis. I recall very well the last patient of this type, on whom I felt it advisable to do therapeutic abortion by abdominal hysterotomy and sterilization, at about the fifth month. That was something over three years ago, and while I have seen a number of such cases since, I have not felt it necessary or advisable to abort them, even in the presence of undoubted nephritis. This is chiefly because we think we have found a better method than we had previously known, for carrying these patients through pregnancy, in relative safety.

It is true, not all our patients in this time, have had the diagnosis of nephritis verified by the various laboratory studies and tests discussed by Dr. Stander, but clinically they were shown to have nephritis, and most of them had been subjected to what Dr. Stander has referred to as the best test of all—the test of pregnancy.

In a number of these patients, on whose cases we have based our reasons for a change of opinion as to treatment, there had been one or more previous pregnancies, with aggravation of the nephritis, and therapeutic abortion, once, twice, or oftener, and yet, in a subsequent pregnancy, we have taken these same women through to term, or near term, and given them living, healthy babies—which, in itself, has perhaps had no small part in counteracting some of the ill effects that might have been expected.

It becomes a question, I think, as to where, or upon what we shall place the evaluation of our results. For instance, I recall one of the earliest cases to be treated by our present methods, now more than three years ago. An unquestioned case of chronic nephritis, for which she had been treated for years, and then, in her pregnancies, three in succession, the marked aggravation of her disease seemed to warrant therapeutic abortion at or before the second trimester. In her fourth pregnancy, there was no serious trouble at all. But we had, to assist us, what her former attendants did not have, namely, a strong, compelling motive for her co-operation, an intense desire for motherhood, which enabled us to put definitely into practice, and to have faithfully followed, the methods we were beginning then to employ for the protection of this type of patient against the ill effects of pregnancy on the already damaged kidneys. Very definite application of fluid balance methods—short interval feedings, with good food, not excluding proteids—restriction of liquids, and dehydration to the extent of definite weight control—enabled us to carry this patient quite satisfactorily to the eighth month. We would not have the slightest fear now in carrying her to term, and then, being one of our first cases, we induced labor, but we gave her a living healthy child. She did not appear the worse for her one successful pregnancy, but lately, I have learned that she finally lapsed from the care of her physician, and died, presumably from her kidney disease.

Now, my point is this: on what shall we base our final values in this case, and others like it? This woman would perhaps have died even earlier, if she had not had a child to live for, for her disease was of a most serious nature. As it was, she had at least three years of satisfactory motherhood, and left a healthy child to take her place. Surely our final mortality was no higher, when we consider her living child, than it would have been, had we aborted and sterilized her in that fourth pregnancy.

Age has been referred to as an important factor. It has not seemed to us to make so much difference, if we can control the patient's food and drink. The woman just mentioned was twenty-three; in a more recent case, the patient was forty-three, and had been aborted twice, because of grave aggravation of her disease, each time requiring months to restore her to her usual health. In a third pregnancy, strict fluid balance observance carried her to spontaneous labor and delivery at term, of a living healthy child, and with no discoverable aggravation of her kidney disease, either during the pregnancy or in the year and a half she has been under observation since.

Another patient gave a history of scarlet fever and prolonged illness in late childhood, and in her first pregnancy had a most severe attack of eclampsia at the sixth month, for which her uterus was emptied. A second pregnancy ended in spontaneous abortion at the fifth month, because of her kidney disease, and again, in her third pregnancy, she had eclampsia with loss of her child, at about the seventh month. In a fourth pregnancy, on a fluid allowance almost unbelievably small—going for nearly four months with scarcely any gain in weight, she delivered spontaneously at term, and now has a healthy child more than a year old, and so far as her family physician can discover, there is no clinical evidence of detriment to her health.

The cases I have cited are but typical of many more in which the consistently good results from our present methods of combating the ill effects of pregnancy on damaged and decompensating kidneys, have led me to change my views on this point, and to become decidedly more optimistic as to results, than I could be from my former experience.

And even if there is evidence at the end of five or ten years, that our maternal mortality is higher than it would have been, had these women all been aborted, I submit that our total mortality, when we consider the children we have saved to the world, to take the place of these doomed mothers, will compare not unfavorably with the results shown by Dr. Stander's large series of cases.

DR. P. BROOKE BLAND.—In our Department covering a period of five years, from 1928 to 1932 inclusive, pregnancy toxemia, including simple nausea and all other types, was encountered in 1,543 patients. The great majority of the cases were, of course, of the simple type.

Of the more serious forms there were: 15 cases of hyperemesis, 1 case of acute yellow atrophy of the liver, 43 cases of low reserve kidney, 123 cases of pre-eclampsia, 16 cases of eclampsia, and 31 cases of nephritis.

Of the latter, one of the patients died, rendering a mortality somewhat in excess of 3 per cent. The immediate maternal mortality of nephritis complicating pregnancy, however, represents only a small fraction of the destructive action of the trouble.

Since practically all of our patients were multiparous women, with from three to fifteen children, it is quite likely that life expectancy has been shortened tremendously and that all, or nearly all, will ultimately succumb to the disease.

I believe that a passive policy as regards treatment will lead to still more serious damage and I am in hearty accord with Doctor Stander in advocating a more radical plan.

DR. BARTON C. HIRST.—It is not easy to agree that gestational toxemia and nephritis in pregnancy have nothing to do with one another, if I understood Dr. Stander's view correctly. Otherwise it would be impossible to explain why 5 per cent of nephritic subjects have eclampsia if they become pregnant while only 0.003 per cent of healthy women display this ultimate expression of gestational toxemia; or why at least a temporary nephritis is almost always a late accompaniment of toxemia. As a matter of fact the toxins from metabolism within the pregnant uterus going to the liver to be oxydized and then to the kidneys to be excreted, cannot be got rid of if the kidney function is impaired, so nephritis is necessarily a predisposing cause of toxemia in pregnancy. A therapeutic abortion in these women must always be considered. I have frequently sterilized them at the same time but it is not always necessary. Contraceptives can often be relied on. If, however, sterilization is desired, I should decidedly object to the unnecessarily radical procedure of hysterectomy. The same result can be attained without mutilation and without the cessation of menstruation, an important consideration in most women. I know of four of my patients at the present moment who are insane from brooding over a mutilation that in their case was unavoidable, and recently I had the unpleasant news that one of them had hung herself.

DR. ABRAHAM CANTAROW.—We have been studying the urea clearance test in pregnancy on Dr. Bland's service at Jefferson and find certain very distinct differences between results obtained in pregnant and in nonpregnant individuals. The concept of blood urea clearance as a mathematical expression of renal functional activity is based upon certain physiologic factors which determine the rate of elimination of urea from the blood under conditions of normal metabolism and blood flow in the nonpregnant state. It seems obvious that alterations in these factors

may occur during pregnancy in view of the profound changes in total metabolism, protein metabolism and circulation which are associated with that state. Because the magnitude of these changes increases progressively throughout the period of gestation, it would appear probable that their effect upon urea elimination should become more marked in the later months of pregnancy.

We are of the opinion, supported by our studies of normal pregnant women, that the end-result of these physiologic changes is a diminution in the blood urea clearance values as calculated on the basis of formulas which represent normal conditions in the nonpregnant state. We believe that the value of the urea clearance test as an accurate index of renal functional efficiency diminishes as the period of gestation lengthens. Subnormal values obtained during the last two months of pregnancy must be interpreted with extreme caution, particularly in the absence of clinical or other laboratory evidence of renal functional impairment.

DR. ROBERT A. KIMBROUGH, JR.—On Dr. Piper's service at the Philadelphia Lying-In Hospital is a special clinic for the study of toxemia in which we are careful in our attempts to differentiate between true toxemia and nephritis complicating pregnancy. We have found the urea clearance test to be the most accurate laboratory index of the degree of renal damage. We feel, however, that certain clinical considerations are of even greater importance in establishing the diagnosis of chronic nephritis. The appearance of hypertension during the first half of pregnancy and its failure to subside within six weeks after delivery strongly indicate the existence of kidney damage.

DR. STANDER (closing).—I sometimes wonder if it would not be a good thing if we could discard the term "toxemia." It is so confusing. Some include nephritis and others do not. We cover a multitude of sins with this term "toxemia of pregnancy."

To answer the question of urea clearance in women who are pregnant and close to term; this has been a disturbing factor to us and I cannot answer at present. The early appearance of signs and symptoms in pregnancy is most important. You find no patient with signs and symptoms of toxemia, that is, a hypertension, albuminuria, headache, etc., during the first half of pregnancy, who has not chronic nephritis. If a woman is only three months pregnant, and she has those symptoms which we call toxemia, you can be almost sure that you are dealing, not with pre-eclampsia or eclampsia, but with chronic nephritis.

I do not disagree with Dr. Hirst in his statements. It is only a difference in definition. I tried to separate any confusion in the etiology. To my way of thinking the kidney has nothing to do with the etiology of eclampsia, as I have seen many patients with eclampsia with no symptoms of nephritis and absolutely normal kidneys.

## THE VALUE OF THE ASCHHEIM-ZONDEK REACTION IN THE DIAGNOSIS AND PROGNOSIS OF CHORIONEPITHELIOMA\*

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CHORIONEPITHELIOMA is a relatively rare disease, usually presenting diagnostic difficulties until unmistakable symptoms of metastasis, either local or distant, appear. When the condition develops before the expulsion of the products of conception, as in the case reported by Schmitz<sup>1</sup> wherein renal hematuria due to metastasis preceded termination of pregnancy by three months, a definite diagnosis is impossible without microscopic examination of the metastatic tissue.

Even the usual case of chorionepithelioma, characterized in its early stage by abnormal uterine bleeding a month or two after the expulsion of the products of conception, is difficult to diagnose by microscopic examination of uterine scrapings, because the chorionic epithelium is normally a proliferative and invasive tissue showing a tendency to persist and penetrate to a considerable depth into the uterine musculature. This is especially marked when the syncytial covering proliferates for no accountable reason and forms polypoid processes which invade the surrounding tissue and lodge in the uterine and even in distant veins (Schmorl<sup>2</sup>). The layer of Langhans is also prone to proliferate in the course of normal or mole pregnancy, break through the surrounding syncytial covering and invade the uterine musculature.

The inadequacy of uterine curettage in the diagnosis of chorionepithelioma is clearly illustrated by the two case histories herein recorded. Though the absence of fragments of chorionic villi and the presence of anaplasia in trophoblastic tissue recovered a month or two after termination of pregnancy are strongly suggestive of chorionepithelioma, a definite diagnosis cannot be made on the strength of these findings alone because they do not show the extent of invasion and necrosis of the myometrium.

In reporting these two cases of chorionepithelioma, the authors hope to emphasize by contrast the value of the Aschheim-Zondek test in the early diagnosis and prognosis of chorionepithelioma and to stress the irreparable damage that may result from intrauterine application of radium in suspected cases through masking pelvic symptoms which

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\*Read at a meeting of the Obstetrical Society of Philadelphia, January 5, 1933.

call for more drastic measures. It is not, however, our intention to dispute the value of irradiation in women afflicted with chorionepithelioma who are physically unfit for panhysterectomy or in those showing extensive vaginal metastasis. Two such cases treated by irradiation alone with good results were recently reported by Schmitz.<sup>1</sup> Keene<sup>3</sup> likewise followed up for a period of fifteen years two women who were treated by means of radium for vaginal metastases; both are thus far living and well. These favorable results with intensive irradiation therapy alone warrant the conclusion that routine post-operative irradiation may lessen the incidence of recurrence of chorionepithelioma and that metastatic tumors of the lungs and liver may possibly respond to intensive irradiation therapy.

CASE 1.—J. T., aged thirty-six, para iii, was admitted to the Mt. Sinai Hospital on May 26, 1932, complaining of uterine bleeding and lower abdominal pain of two weeks' duration, following a missed period.

She began to menstruate at sixteen and continued at intervals of seven to eight weeks until the onset of her present illness. During July, 1930, she was admitted to the wards of the University Hospital for profuse uterine bleeding. She was then about four months pregnant. A rather large hydatidiform mole was removed with placental forceps. She was readmitted to the University Hospital on Oct. 11, 1930, because of continued bleeding. A uterine curettage recovered insufficient tissue for diagnosis; the fragments recovered showed no evidence of chorionepithelioma.

The uterine bleeding continued at irregular intervals until December, 1930, when a diagnostic curettage was again performed and 600 mg. hours of radium applied at the American Stomach Hospital.

For the following eighteen months she menstruated, as was her habit, at intervals of seven to eight weeks until her admission to the Mt. Sinai Hospital.

*Findings.*—Preoperative physical examination of her chest failed to reveal the condition later discovered through x-ray studies. Her uterus was somewhat soft, only slightly enlarged and freely movable. There was a palpable, small, tender mass in the left uterine horn; otherwise, the pelvis was negative. Her blood count, blood chemistry, and Wassermann test were also negative. The sedimentation test, however, showed a sharp decline. Her temperature and pulse rate were normal. The rabbit test was positive for pregnancy. On the strength of these findings, a diagnosis of interstitial tubal pregnancy was made.

At operation part of the small intestine was found adherent to the left uterine horn which was thickened and infiltrated. The uterus, as a whole, was somewhat enlarged and congested. The fallopian tubes and ovaries appeared normal. Believing that the patient had a perforation of the left uterine horn as a result of a criminal abortion, a supravaginal hysterectomy and a left-sided salpingo-oophorectomy were performed. The right tube and ovary were left in situ; the appendix was removed.

Section of the removed uterus showed that the upper left part of the organ was replaced by a soft, friable, adenomatous tissue which penetrated the entire thickness of the uterine wall. The endometrium in other parts appeared fairly normal. Microscopically, unmistakable evidence of chorionepithelioma was present. The removed ovary, which was not enlarged, showed one well-developed corpus luteum, numerous atretic follicles and areas of hemorrhage into the stroma. There was no evidence of hyperluteinization.

Roentgen ray study of the lungs a few days after operation showed two large nodules, one measuring  $3\frac{1}{2}$  cm. and the other  $2\frac{1}{2}$  cm. in diameter, in the upper lobe of the left lung. Repetition of the Aschheim-Zondek test showed that as little as 1 c.c. of her urine evoked a very strong reaction. The stimulated rabbit ovaries resembled a diminutive bunch of grapes. The patient was subjected to intensive x-ray treatment of the affected lung and pelvis, and had an uneventful post-operative convalescence.

With the gradual decrease in the size of the metastatic tumors, probably as a result of continued irradiation treatment, there is a corresponding decrease in excretion of prolan so that now, after a lapse of six months, 20 c.c. of her urine evoke no more than the ordinary pregnancy reaction in the isolated rabbit. X-ray study of her lungs on Dec. 12, 1932, showed complete disappearance of one nodule and a decrease in size of the other to half its original size.

CASE 2.—G. P., aged forty-four, a mother of three children, was admitted to the wards of the Mt. Sinai Hospital on December 2, 1927, for the treatment of intermenstrual staining of three months' duration. The abnormal uterine bleeding appeared two months after an early abortion for which she was treated at her home by her family physician. Examination of her chest revealed nothing abnormal. Pelvic examination showed a somewhat thickened, easily bleeding cervix and a moderate rectocele. Otherwise the generative organs were found to be normal. Her blood count, blood chemistry, and Wassermann test were negative.

Fundal or cervical malignancy, chorionepithelioma and preclimacteric functional uterine bleeding were the possibilities considered, hence endometrial and cervical tissues were obtained for examination and 50 mg. of radium implanted into the uterine cavity for twenty-four hours. Dr. Davidsohn reported on the microscopic findings of the tissues as follows: "There is no evidence of malignancy in the cervical tissue. The bulk of the scrapings is clotted blood. The little endometrium present is of the interval type. One area, however, consisting mainly of fibrous and muscle tissue, shows a large number of cells with huge dark-staining nuclei; others have the appearance of syncytium: There is no evidence of anaplasia or necrosis."

In view of these suggestive microscopic findings, the woman was followed up carefully for a period of six months, during which time she enjoyed good health. On Sept. 7, 1928, approximately ten months after her discharge from the hospital, she was readmitted on the medical service with a slight elevation of temperature, hematuria, and hemoptysis of two weeks' duration. Vaginal examination revealed extensive metastasis in the anterior and left lateral vaginal walls. At no time since the application of radium did she have vaginal bleeding. Roentgen ray studies of the chest showed a small nodule in the base of the right lung.

The hemoptysis, loss of weight and toxicity gradually increased until her death on Oct. 20, 1928, six weeks after her second admission to the hospital. Autopsy revealed metastasis of the lungs, liver, and kidneys. Unfortunately, the pituitary changes in this case were not ascertained because we had no permission to open the skull.

The significance of the Aschheim-Zondek reaction in the diagnosis of chorionepithelioma was not known at the time of this patient's illness. Had she been studied by means of this test, an early hysterectomy might have stayed the progress of the disease.

*Comment.*—In the first case, herein recorded, two diagnostic curettements, at an interval of four months, failed to reveal the true state of affairs, thus stressing the unreliability of the procedure in the early diagnosis of the disease.



In both patients the intrauterine application of 600 and 1200 mg. hours of radium, respectively, not only failed to arrest the progress of the disease but tended to mask the local symptoms until metastases in the lungs appeared. This leads us to the conclusion that abnormal uterine bleeding occurring within a few months after a normal or mole pregnancy should not be treated by irradiation on the assumption that the bleeding is of the so-called functional type. If the curette recovers fragments of chorionic villi, there is no immediate need of further treatment. If, however, the scrapings show chorionic epithelium without a connective tissue core, the presence of chorionepithelioma, even in the absence of continued uterine bleeding, is strongly suggestive. In such cases, repeated quantitative Aschheim-Zondek tests are of inestimable value in guiding our future course.

As shown in the history of the first patient, regression of the metastatic lung tumor is accompanied by a corresponding decrease in the amount of the anterior pituitary-like substance in the morning specimen of urine, showing a quantitative relationship between the production of the hormone and the size of the tumor mass.

#### THE ASCHHEIM-ZONDEK REACTION IN CHORIONEPITHELIOMA

In 1929, Fels<sup>4</sup> and Rössler<sup>5</sup> observed that women suffering from hydatidiform mole or chorionepithelioma excrete many times more of the hormone than normally pregnant women and that quantitative estimation of the hormone excreted is an accurate guide in differentiating hydatidiform mole from uterine bleeding in the course of pregnancy due to other causes. Further observations led them to the conclusion that the presence of increasing quantities of the hormone two weeks after termination of normal pregnancy or eight weeks after a mole pregnancy is pathognomonic of chorionepithelioma and that after complete removal of the growth the persistence of appreciable quantities of the hormone in the urine is indicative of metastasis. This discovery placed at our disposal one of the most valuable diagnostic and prognostic laboratory procedures in the management of chorionepithelioma.

Since then, numerous authentic reports of the value of the Aschheim-Zondek reaction in the diagnosis and prognosis of this disease have appeared in the literature. Schultze-Rhönhof<sup>6</sup> reported three cases of chorionepithelioma in which the Aschheim-Zondek reaction promptly disappeared after the removal of the growths. Fahlbusch<sup>7</sup> places so much reliance on the test that in one instance he desisted from operating on a bleeding woman despite the diagnosis of chorionepithelioma from curettements, because the Aschheim-Zondek reaction was repeatedly negative. Subsequent history of the case proved that he was right. Mack<sup>8</sup> studied two women after operation for chorionepithelioma by means of the Aschheim-Zondek reaction. One of the

two in whom the test became negative is well; in the other, the persistence of a strong positive reaction after operation antedated the development of metastatic nodules in the vagina.

Thus far, approximately fifty cases of chorionepithelioma studied by means of the Aschheim-Zondek reaction have been reported in the literature. All of these show the value of the test in the diagnosis and prognosis of hydatidiform mole and chorionepithelioma.

According to Ehrhardt<sup>9</sup> and others, the concentration of the anterior pituitary-like hormone, prolan, in the urine of women suffering from hydatidiform mole is sufficient to render a reaction in the infantile mouse with as little as 1/520 c.c. of urine. He demonstrated the presence of 100 mouse units of the hormone per cubic centimeter of urine in a case of chorionepithelioma. Robert Myer (cited by Ehrhardt<sup>9</sup>) likewise recovered 70 mouse units of the hormone per cubic centimeter of urine in a case of testicular chorionepithelioma. In contrast to these high values, the urine of normally pregnant women never yields more than 5 mouse units of the hormone per cubic centimeter.

The importance of evaluating *quantitatively* a persistent Aschheim-Zondek reaction after the expulsion or operative removal of a hydatidiform mole is well illustrated in the history of a woman previously reported by one of us (Mazer<sup>10</sup>). On the strength of a persistent qualitative Aschheim-Zondek reaction, a diagnosis of chorionepithelioma was made and a hysterectomy recommended by a competent gynecologist, one month after the expulsion of a hydatidiform mole. Repeated Aschheim-Zondek tests by the fractional method showed decreasing quantities of the hormone, on the strength of which we advised against an operation despite temporary abnormal uterine bleeding. The woman spontaneously ceased to bleed and later conceived and was delivered of a healthy child.

It must, therefore, be remembered that the Aschheim-Zondek reaction may persist for two months or longer after the expulsion or operative removal of a hydatidiform mole, and that in resorting to the Aschheim-Zondek test in suspected cases of chorionepithelioma, *quantitative differences* are most important. The presence of increasing quantities of the hormone is pathognomonic of this disease.

#### THE PITUITARY AND OVARIAN CHANGES IN CHORIONEPITHELIOMA AND THEIR RELATION TO THE PLACENTAL HORMONE, PROLAN

With the advent of our recent knowledge in sex physiology and our appreciation of the pivotal rôle of the anterior pituitary lobe in the sexual and gestational cycles, interest was naturally centered on the histology of the anterior pituitary lobe of women suffering from chorionepithelioma.

The pituitary changes occurring in the course of normal pregnancy were fully described by Erdheim and Stumme<sup>11</sup> as early as 1909. In

1929, Rössler<sup>5</sup> described a somewhat atypical pituitary pregnancy reaction in a woman who had died of metastatic chorionepithelioma eighteen months after extirpation of the initial lesion. Her urine persistently yielded positive Aschheim-Zondek reactions. In the case of chorionepithelioma reported by Novak and Koff<sup>12</sup> a year later, typical pituitary changes of pregnancy were found, namely, the transformation of the chromophobes into large cells with clear and somewhat irregular nuclei and abundant cytoplasm containing dust-like granules which stain pink with acid fuchsin and eosin. Zondek<sup>13</sup> found the same anterior pituitary changes in a man who had died of chorionepithelioma.

Experimentally, Fels<sup>4</sup> produced the same effect in test animals by injections of fluid obtained from hydatidiform vesicles. Berblinger<sup>14</sup> and Baniecki<sup>15</sup> produced typical pregnancy changes in the hypophyses of rabbits and guinea pigs by injections of placental extracts.

These clinical and experimental data seem to indicate that the hypophyseal pregnancy changes of normal and chorionepitheliomatous women are due to stimulation by a hormone elaborated by chorionic epithelium and that the product, prolán, obtained from the urine of pregnancy is not the pituitary sex hormone but rather a principle capable of stimulating the sex cells of the anterior pituitary lobe to increased activity. The observation of Reichert<sup>16</sup> that prolán is ineffective in stimulating ovarian activity in hypophysectomized rats and puppies is supportive of the aforementioned hypothesis. Hill and Parkes,<sup>17</sup> however, deny the accuracy of Reichert's findings and attribute the ineffectiveness of prolán to stimulate the ovaries of hypophysectomized animals to the high concentration of toxic substances said to be present in prolán. The fact that the maximum ovarian effect of prolán is far below that of anterior pituitary lobe extracts (Evans<sup>18</sup>) is further evidence that prolán is biologically different from the anterior pituitary sex hormone.

*Lutein Cysts.*—That hyperluteinization of the ovaries is the result of excessive pituitary stimulation was shown by the experimental work of Evans<sup>19</sup> as early as 1921, and later by the work of Zondek and Aschheim<sup>20</sup> and others. The degree of luteinization primarily depends upon the amount of anterior pituitary lobe tissue or extracts thereof employed in treating test animals. Individual and species susceptibility to the hormone and the method of administration are naturally important factors. Clinically, Wagner<sup>21</sup> found polycystic ovaries, typical of those seen in hydatidiform mole or chorionepithelioma, in a nonpregnant woman suffering from a pituitary adenoma. Her uterus was extirpated because of the possible presence of chorionepithelioma. Microscopic examination, however, showed an exaggerated pseudodecidual reaction and no evidence of trophoblastic tissue. She was thereafter treated by intensive irradiation of the

pituitary gland, hence, there was no possibility of determining the cellular structure of the pituitary tumor which provoked hyperluteinization.

The luteal hormone, progesterin, primarily exerts its effect on the endometrium in creating a nidatory state but does not, in the light of our present knowledge, directly influence the embryonic structures. It is, therefore, apparent that the lutein cysts found in hydatidiform mole and chorionepithelioma are the result of excessive stimulation derived from the anterior pituitary lobe and bear no causal relation to these conditions as Santi (cited by Novak and Koff<sup>12</sup>) and others believe. The fact that these cysts often persist for a considerable period of time after termination of a hydatidiform-mole pregnancy without giving rise to abnormal endometrial changes is clinical evidence that the formation of lutein cysts is sequential and not causative of hydatidiform mole and chorionepithelioma.

Some degree of abnormal lutein activity in the theca interna and granulosa is practically always present in hydatidiform mole and chorionepithelioma, even in the absence of enlargement of the ovaries, though in our case the extirpated ovary shows no evidence of abnormal lutein activity. Whether the other ovary, left in situ, would show lutein activity were it available for examination is problematical.

In chorionepithelioma the incidence of large lutein cysts is only 9½ per cent, whereas in hydatidiform mole they are present in 59 per cent of the cases. These cysts invariably regress spontaneously after the removal of the hydatidiform mole or chorionepithelioma, again indicating their dependence upon the uterine lesion which, as stated before, probably exerts its influence on the ovaries through the medium of the anterior pituitary lobe.

#### SUMMARY AND CONCLUSION

Abnormal uterine bleeding following a normal or mole pregnancy should not be treated by radium because it masks the local symptoms of chorionepithelioma.

It is impossible to make an early diagnosis of chorionepithelioma by means of uterine curettage.

The two cases of chorionepithelioma herein reported show by contrast the value of the Aschheim-Zondek reaction in the diagnosis and prognosis of the disease.

The source of the hormone, prolactin, responsible for the Aschheim-Zondek reaction, is living chorionic epithelium which should not persist longer than two weeks after termination of a normal pregnancy or eight weeks after expulsion or operative removal of mole pregnancy.

The quantity of the hormone, prolactin, excreted is proportional to the amount of abnormal chorionic epithelium present, hence a gradual increase in prolactin excretion accompanying abnormal uterine bleeding

following termination of normal or mole pregnancy is indicative of a proliferative process—chorionepithelioma.

Persistence of the Aschheim-Zondek reaction after extirpation of the uterus for chorionepithelioma points to metastasis which should be located and treated by means of intensive irradiation.

Prolan is probably a placental hormone and exerts its influence on the ovaries through the medium of the anterior pituitary lobe. The degree of ovarian response in chorionepithelioma is variable, depending upon intrinsic ovarian conditions and the responsiveness of the anterior hypophysis to prolan stimulation.

#### REFERENCES

- (1) *Schmitz, H.*: AM. J. OBST. & GYNEC. 21: 256, 1931. (2) *Schmorl, G.*: Verhandl. d. deutsch. path. Gesellsch. 8: 39, 1904. (3) *Keene, F. E.*: Cited by R. T. Frank and S. H. Geist, Practice of Surgery, W. F. Prior Co., Inc., Hagerstown, Md. 11: Chapt. 20, 1928. (4) *Fels, E.*: Zentralbl. f. Gynäk. 53: 466, 1929. (5) *Rössler, H.*: Ztschr. f. Geburtsh. u. Gynäk. 96: 516, 1929. (6) *Schultze-Rhonhof, F.*: Zentralbl. f. Gynäk. 54: 578, 1930. (7) *Fahlbusch, O.*: Zentralbl. f. Gynäk. 54: 1542, 1930. (8) *Mack, H. C., and Catherwood, A. E.*: AM. J. OBST. & GYNEC. 20: 670, 1930. (9) *Ehrhardt, K.*: Surg. Gynec. Obst. 53: 486, 1931. (10) *Mazer, C., and Goldstein, L.*: Endocrinology of the Female, Philadelphia, 1932, W. B. Saunders Co. (11) *Erdheim, J., and Stumme, E.*: Beitr. z. path. Anat. u. z. allg. Path. 46: 1, 1909. (12) *Novak, E., and Koff, A. K.*: AM. J. OBST. & GYNEC. 20: 481, 1930. (13) *Zondek, B.*: Chirurg. 2: 1072, 1930. (14) *Berblinger, W.*: Verhandl. d. deutsch. path. Gesellsch. 17: 184, 1914. (15) *Baniecki, H.*: Arch. f. Gynäk. 134: 693, 1928. (16) *Reichert, F. L., Pencharz, R. I., Simpson, M. E., Meyer, K., and Evans, H. M.*: Proc. Soc. Exper. Biol. & Med. 28: 843, 1931. (17) *Hill, M., and Parkes, A. S.*: J. Physiol. 69: 23, 1930. (18) *Evans, H. M., Meyer, K., and Simpson, M. E.*: Proc. Soc. Exper. Biol. & Med. 28: 845, 1931. (19) *Evans, H. M., and Long, J. A.*: Anat. Rec. 21: 62, 1921. (20) *Zondek, B., and Aschheim, S.*: Klin. Wchnschr. 6: 248, 1927. (21) *Wagner, G. A.*: Zentralbl. f. Gynäk. 52: 10, 1928.

1829 PINE STREET.

#### DISCUSSION

DR. FRANKLIN L. PAYNE.—The first case reported was treated before we were as generally hormone conscious as we are at the present time.

I would like to ask, What happens to the female sex hormone in hydatidiform mole? Is it increased or does it disappear from the blood and the urine? In the diagnosis of chorionepithelioma the criteria are fairly clear. Eight weeks after a mole has been expelled, if the Aschheim-Zondek test is positive in increasing dilutions of urine, we certainly suspect chorionepithelioma. Two weeks after normal delivery, if such is the case, we suspect chorionepithelioma. What are the criteria by which we can make a diagnosis of mole?

In attempting to diagnose mole, recently I injected 3 c.c. of urine in divided doses and got a positive reaction. The next day x-ray diagnosis of twins was made.

Another point that should be noted in following up chorionepitheliomas with the Aschheim-Zondek test is that these patients usually have total hysterectomy, and may give false positives as a result of the removal of the ovaries. We must therefore dilute the urine when testing for metastases or local recurrence.

I cannot agree with Dr. Mazer's statement that chorionepithelioma should be suspected in all cases of vaginal or uterine bleeding which develop after pregnancy. In a recent review of 420 cases of functional uterine hemorrhage at the University Hospital, we found that a surprisingly large number of these patients gave such a history. The subsequent records of these patients showed that none had chorionepithelioma.

DR. JOHN C. HIRST.—I had another case that I presumed to be a twin pregnancy at ten weeks, who behaved almost identically as the above patient with profuse bleeding, over-enlarged uterus, etc., resembling hydatidiform mole. This woman gave a strongly positive Friedmann test with the use of only 2 c.c. of urine (i.e., only one-fifth the usual amount) and later proved to be a twin pregnancy.

DR. DANIEL LONGAKER.—I feel that a word of caution should be offered regarding the acceptance of the Aschheim-Zondek test and the Friedmann test as evidence of chorioneptithelioma in the absence of clinical evidence.

In one case that came under our care about eighteen months ago, a positive diagnosis of chorioneptithelioma was made because of a persistent Friedmann test and Aschheim-Zondek test. Dr. Mazer had the opportunity to examine and verify this finding after I was bold enough to save this woman's uterus, ovaries, contents of her pelvis, and certainly her happiness. She was only twenty-two years of age. She was not operated upon, made a perfect recovery, and it seems safe to say that she did not have chorioneptithelioma; there was no clinical evidence.

DR. THADDEUS L. MONTGOMERY.—During the past week I have discharged from the hospital a patient whose clinical history, biologic tests, and pathologic findings have some bearing on the problem presented in this paper, and on one of the questions raised in the discussion. I refer particularly to the frequency of a positive estrin test in hydatidiform mole and chorioneptithelioma.

The patient started some six months ago with what appeared to be a normal pregnancy. For two months, however, she suffered with rather severe nausea and vomiting. At the fourth month the uterus failed to increase in size, in fact it appeared to regress in its dimensions.

Vaginal bleeding associated with serous discharge set in three weeks ago and became so severe that I was forced to perform a dilatation and evacuation. The specimen removed consisted of the ovular sac and a small embryo. In a few areas the chorionic villi showed the typical cystic appearance of hydatidiform mole, and the histologic section presented the microscopic picture of the same condition. The embryo was only 17 millimeters in length, corresponding with a six weeks' rather than a six months' pregnancy. Surprising to say, it was not necrotic. Its nutrition and growth had apparently been simply interfered with by the moderate hyperplasia of the chorionic epithelium.

The biologic tests were interesting. Three weeks before the dilatation and evacuation was performed both tests were positive. On the eve of the operation, the Aschheim-Zondek test was positive, while the Mazer-Hoffman was negative.

DR. JACOB HOFFMANN.—The Aschheim-Zondek reaction is undoubtedly a most important adjunct in the diagnosis of chorioneptithelioma. For purposes of prognosis, however, its value is less certain. Clinically and histologically it is almost impossible to differentiate between the benign and malignant forms of this condition. Both may give a similar clinical picture and either may give rise to metastases. Indeed, some authorities believe that these two forms are identical and that the outcome of the case depends upon the amount of antitrophoblastic agents present in the host. Since the Aschheim-Zondek reaction is positive for both forms, it fails to aid in the task of differentiation, and we remain, as before, dependent upon the occurrence of death for the determination of what form it is with which we have been dealing.

Under the circumstances, therefore, it would seem best, before undertaking any radical procedure, to consider all factors, clinical and otherwise. The mere fact that a positive reaction has been obtained is not sufficient to justify such procedure. Emphasis should rather be placed upon the clinical evidence, especially when we recall that as yet it has not been established that a negative reaction rules out chorioneptithelioma.

DR. MAZER (concluding).—The urine of women suffering from chorionepithelioma, whether benign or malignant, shows a high and progressive concentration of prolan. Since we have no means at our disposal of determining the degree of malignancy of the growth, it is essential that these patients be treated intensively, and the progress of the condition gauged by the prolan-content of the urine. Diminishing quantities of the hormone imply improvement; its total disappearance indicates either a temporary or permanent cure.

In the case of hydatidiform mole, cited by Dr. Longaker, the first test was purely qualitative and was positive because it was performed only a month after the expulsion of the mole. Subsequent tests showed a gradual decrease in the quantity of prolan excreted, arguing against the presence of chorionepithelioma.

Dr. Hirst's patient, who bore twins, showed a positive reaction with one-fifth of the usual quantity of urine employed in the Aschheim-Zondek test when she was three months pregnant. The concentration of prolan in the urine of women at the end of three months is at least four times that of very early pregnancy. The positive reaction obtained with so small a quantity of urine, in this case, was probably not due to the larger amount of chorionic tissue present in the placenta of a twin pregnancy, but rather to the relatively advanced stage of pregnancy. The quantity of the anterior pituitary-like substance, prolan, increases as pregnancy progresses up to the fifth or sixth month; thereafter, there is a gradual decrease in the quantity of the hormone.

Definite data concerning the presence or absence of excessive quantities of estrin in the urine of women suffering from chorionepithelioma are not available. Theoretically, the lutein cysts should produce a sufficient quantity of estrin to be evident in the urine when injected into castrated rodents, but only 9½ per cent of women suffering from chorionepithelioma show the presence of lutein cysts. The urine of Case 1, herein reported, showed no excess quantity of estrin probably because of the absence of lutein cysts.

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## THE INCIDENCE AND SIGNIFICANCE OF FALSE POSITIVE PREGNANCY REACTIONS\*

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A SURVEY of the published reports of the results obtained with the hormonal tests for pregnancy is certain to impress one with the high percentage of reliability. It should, however, be emphasized that these procedures in common with other biologic tests are subject to errors. These errors may arise from faulty technic or may be inherent in the actual limitations of the tests. Clinicians must bear in mind that these tests are primarily for the detection of the presence of demonstrable quantities of anterior pituitary sex hormone or female sex hormone in the urine as found in several physiologic and pathologic states aside from pregnancy. It might be supposed that such a possibility would affect the accuracy of the tests for the presence of living chorionic elements in the body.

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\*Read at the Meeting of the Obstetrical Society of Philadelphia, January 5, 1933.

The purpose of this paper is to examine the so-called pregnancy tests and the reasons for their failure to give absolute accuracy in non-pregnant conditions. It follows that the results obtained by these tests should be utilized only as adjuncts to clinical findings in the same manner as any other laboratory procedure, as, for example, the Wassermann test.

We have had the opportunity to study a series of problem cases, using both a modification of the Friedman rabbit test and the original estrin test. Table I, which summarizes our results to date, includes a previously reported series (1) of one hundred and eighty-two rabbit tests and five hundred estrin tests.

TABLE I

	RABBIT TEST		ESTRIN TEST	
	TOTAL CASES	%	TOTAL CASES	%
Pregnant				
Correct Positives	167	93.7	252	77.5
False Negatives	11	6.3	73	22.5
Total	178		325	
Nonpregnant				
Correct Negatives	168	94.4	355	96.8
False Positives	10	5.6	12	3.2
Total	178		367	
	356		692	

It will be noted that false positive readings reaching to 5.6 per cent have been obtained in this study. This would seem to indicate a relatively high degree of inaccuracy but it should be kept in mind that a misinterpretation of some of the statistics in the literature has been responsible for the prevailing notion of the low incidence of false positives. The average error reported has been under 5 per cent. This figure has been computed on the basis of errors per total cases studied rather than on the percentage of nonpregnant cases presenting diagnostic difficulties. Thus, 10 false positive results in a total of 356 cases affords 2.8 per cent error, while the same number based on the nonpregnant cases alone yields a 5.6 per cent discrepancy.

In order to evaluate the reliability of the tests it is important to ascertain the conditions which are likely to give false reactions in the non-pregnant woman. Among these have been reported the climacteric, primary ovarian hypofunction, ovarian cysts, hyperthyroidism, chorion-epithelioma, retained placental tissue, and malignancy.

*Climacteric.*—The climacteric is one of the conditions which may give rise to false positive reactions. The gradual decrease in ovarian activity associated with this state is accompanied by a compensatory hypertrophy of the anterior pituitary lobe and a readjustment of the



endocrine balance of the body. It should be remembered that normal quantities of anterior pituitary hormone as present in the blood of regularly menstruating women are not demonstrable by the use of injections of whole blood serum. Fluhman<sup>2</sup> and Mazer<sup>3</sup> have investigated the hormone content of the blood of women in the climacteric. They demonstrated the presence of an excess of anterior pituitary secretion in about 60 per cent of climacteric women.

These findings are in accord with the gross and histologic changes found in the anterior pituitary gland of women following castration, namely, an increase in the basophilic cells and the presence of castration cells.<sup>4, 5</sup> Engle<sup>6</sup> showed a definitely greater amount of hormone in the pituitary of the gonadectomized animal than in the normal when both were subjected to the same test conditions. The histologic findings in the gland plus the evidence of hypersecretion suggest a compensatory hypertrophy of the sex-stimulating cells of the anterior pituitary lobe, the purpose of which is to stimulate the activity of the failing ovary. However, the excretion of anterior pituitary hormone in the urine at the climacteric may be due to the inability of the ovaries to utilize it. A more likely possibility is that there is a withdrawal of the inhibitory influence which the normally functioning ovary exerts on the anterior pituitary. Zondek<sup>7</sup> points out that since pituitary transplants are capable of stimulating the senile ovary of a mouse or rat, the second possibility is the more likely. According to Kraul<sup>8</sup> it has been shown that the administration of estrin after castration prevented the usual changes in the anterior pituitary gland.

Climacteric women occasionally show demonstrable quantities of the female sex hormone in their urine. This results because of three factors: first, the inability of the endometrium to store and utilize the small quantities of estrin present in the blood of menopausal women; secondly, because of a decreased renal threshold to the elimination of the hormone,<sup>9</sup> and lastly, because of the persistence of cystic follicles which continue to function.

The excretion of both hormones of pregnancy in the urine, as explained above would account for the production of false positive results in the climacteric woman. Thus Zondek reported the presence of Prolan B in the urine of patients who had had a bilateral oophorectomy.<sup>10</sup> Hannan<sup>11</sup> obtained false positive reactions in 4 of 12 climacteric women. Allen and Dickens<sup>12</sup> report the repetition of false positive reactions with two separate specimens of urine from a woman at the menopause. The following case is illustrative of our experience.

Mrs. A. B., aged thirty-nine years, when first seen was amenorrheic for four months. Her periods previously had been regular. Examination failed to reveal any enlargement of the uterus. Urine was subjected to the test for pregnancy. The estrin test was negative but the Aschheim-Zondek reaction was positive. Several months later she was complaining of typical menopausal symptoms. Her periods were recurring at six- to eight-week intervals.

*Primary Ovarian Hypofunction.*—A similar state of compensatory hypertrophy and hypersecretion of the anterior lobe exists in cases of primary ovarian hypofunction. The existence of this condition of the ovaries independent of anterior pituitary deficiency during the active sexual life of women has been reported by several authorities. In women with evidence of endocrinopathy usually associated with menstrual irregularities, especially amenorrhea, primary ovarian deficiency is demonstrable in from 15 to 20 per cent of cases.<sup>13, 14, 15</sup> The finding of a positive Fluhman test eliminates the anterior pituitary gland as the causative factor.

The simultaneous presence of anterior pituitary sex hormone and the absence of demonstrable quantities of estrin in the blood of these women establishes the diagnosis of primary ovarian hypofunction. The presence of a positive Fluhman test accounts for the excess secretion of the hormone in the urine and the production of false positive pregnancy tests. The amenorrhea frequently resulting from this primary condition is mistaken for a symptom of early pregnancy and the presence of a false positive reaction further serves to confuse the diagnosis. Studies for the level of estrin in the blood (Frank and Goldberger test) and the characteristic clinical findings help to avoid confusion in these instances. The following case history is illustrative.

Mrs. R. P., twenty-three years of age, was seen June 25, 1932. She had one child sixteen months old. Her general appearance and demeanor were typical of women who have primary ovarian hypofunction. Her menses had always been normal. Her last period was on April 23, 1932. She had slight vaginal bleeding a few days before her visit to the office. Examination showed the uterus to be retroverted and apparently not enlarged. There was no discoloration of the cervix. Urine was taken for a pregnancy test. The estrin test was negative. The rabbit test, however, was positive. Because of these findings and the history, the possibility of a dead ovum was considered. During the second week in July the patient stained slightly but had no real menstrual flow. Reexamination on July 26 and subsequent events eliminated the existence of pregnancy.

*Hyperthyroidism.*—Hyperthyroidism is a further cause for the occurrence of false positive reactions with the anterior pituitary pregnancy tests. Amenorrhea or irregular menses were found in 57 per cent of cases of exophthalmic goiter by Gardiner-Hill and Smith.<sup>16</sup> Bram<sup>17</sup> corroborated this figure.

The suppression of menstrual activity here is probably the result of a severe systemic depression affecting all tissues of the body. In such cases hypertrophy of the anterior pituitary gland has been noted.<sup>18</sup> Hyperfunction of the thyroid experimentally in the animal stimulates the sex cells of the anterior lobe with a resultant production of an excess of anterior pituitary sex hormone and a persistence of the corpus luteum, causing a suppression of menstruation and an excess production of

estrin.<sup>19</sup> This was not demonstrated in human beings, however. The following case emphasizes the unreliability of the test in the presence of hyperthyroidism.

Mrs. A. S., aged forty-three years, had always had a regular menstrual cycle until August 23, 1931. The following period was missed. Study of the patient by her family physician revealed a marked hyperthyroidism with visible enlargement of the thyroid but no exophthalmus. Both the rabbit and estrin tests taken after six weeks of amenorrhea were positive. The patient was then referred to us for a therapeutic abortion. Examination failed to establish the presence of a pregnancy at this time and she was advised to wait several weeks. Subsequent examination eliminated the presence of pregnancy; the patient menstruated several months later.

It is possible because of the woman's age that the climacteric was the responsible factor for the false positive reaction.

*Ovarian Cysts.*—In addition, ovarian cysts associated with amenorrhea have on several occasions yielded false positive pregnancy tests by both methods. The continued production of estrin by the epithelium lining the cyst wall and the continued efforts of the anterior lobe to complete the ovarian cycle result in excess amounts of both hormones in the urine of these women as illustrated in the following case.

Mrs. R. F., aged twenty-six years, married three years, had aborted one year ago. Patient missed her period in December, 1931. Since then she has bled monthly but the flow has been decreased. Her last period was on February 12, 1932. Both hormone tests taken a few days before this period were positive. She was seen again on May 20, 1932. At this time, on examination the uterus was thought to be enlarged to the size of a three and a half months' pregnancy. The patient stated that she had had no intercourse for a period of five months. Repetition of the estrin test yielded a positive reading on May 23. The same test repeated on May 25 gave a negative result. In view of the previous positive tests, the disproportionate enlargement of the uterus, and the abstinence from coitus, a diagnosis of fetal death was made. On June 11, the patient reported that she had just finished a menstrual period. Reexamination revealed the true pathologic condition. The uterus was found to be small and a large ovarian cyst was palpable behind and to the right of the fundus.

*Fetal Death, Inevitable Abortion, Ectopic Pregnancy.*—Fetal death, inevitable abortion, and ectopic pregnancy likewise merit consideration in this discussion. The anterior pituitary sex hormone test is really for a functional placenta or chorionic derivatives. Moreover, the presence of the hormones of pregnancy can be demonstrated in the urine for a week after the total expulsion of the fetus and placenta. Therefore a positive reaction does not establish the presence of a fetus. Likewise, during the first week after delivery a positive test is no indication of retention of placental elements.

The continued elaboration of the sex hormones depends upon a vascular connection between the trophoblast or its successor, the chorionic

villi, and the maternal organs. Death of the ovum, either intrauterine or ectopic, does not necessarily result in separation of vascular contact between maternal organs and the product of conception. This permits continued production of anterior pituitary sex hormone in these cases.

Bland and his coworkers<sup>20</sup> claim that the simultaneous use of the Aschheim-Zondek and the estrin tests has proved of value in the diagnosis of fetal death. They found that patients who gave a positive Aschheim-Zondek reaction and a negative estrin test on repeated occasions eventually miscarried. Our experience with the tests in cases of fetal death and inevitable abortion has been variable and inconclusive.

In one instance we were temporarily misled because of our misinterpretation of what we believed to be a false positive reaction.

Mrs. E. M., aged twenty-three years, had an infected abortion two years ago. Her menstrual cycle had always been normal. She was a short, thin, extremely feminine blonde, a characteristic picture of the hypoovarian type. She missed her December, 1932, period but had slight staining at this time, associated with some abdominal pain. Examination revealed a mucopurulent cervical discharge and a fundus smaller than normal. The urine gave a positive rabbit test and two negative estrin tests. With subsidence of symptoms, the characteristic appearance of the patient, the small fundus, and two negative estrin tests, it was thought that the rabbit test was a false positive reaction due to primary ovarian hypofunction. Subsequent observation and operation proved the presence of an ectopic pregnancy.

*Malignancy.*—The findings of others in cases of malignancy are pertinent to a study of the causes of false positive reactions. Zondek<sup>21</sup> claimed originally to have obtained characteristic pregnancy response by the injection of urine in 15 per cent of 118 cases of malignant disease. More recently he reports<sup>22</sup> that the urine of carcinomatous patients will produce only APR-i, and very rarely ii and iii. Hannan<sup>11</sup> demonstrated the presence of anterior pituitary hormone in the urine in sufficient quantity to give a positive Aschheim-Zondek reaction in mice in 2 of 7 cases of genital carcinoma. Sussman<sup>23</sup> in a study of the relationship of pituitary activity to malignancy reported positive Aschheim-Zondek tests in 14 of 18 cases of malignancy and confirmed by histologic study the fact that the anterior lobe did show a degree of activity appreciably higher than in the normal. We obtained no false positives in this class of patients.

*Organotherapy.*—It should be borne in mind that occasionally urine specimens are obtained from patients who are under treatment for sterility or menstrual disorders. In such cases one should be certain that the patient is not receiving roentgen ray stimulation to the ovaries and anterior pituitary gland, or hormonal therapy in any form before accepting a positive urine reaction as indicative of pregnancy.

The case of Mrs. M. B., is in point. She was twenty years of age. Her menses had started at the age of thirteen and were regular until her child was born. Since then she has menstruated at intervals varying from three to eight months. She had been amenorrheic for four months previous to her visit on April 9, 1932. Pelvic examination revealed an infantile uterus and no other pathologic condition. She was treated with massive doses of female sex hormone, moderate quantities of thyroid, and regulation of diet. One month later she was still amenorrheic, but the uterus had increased to such size that pregnancy was suspected. The estrin test, however, was negative. The following month examination showed a slight decrease in the size of the uterus and the patient was still amenorrheic. X-ray stimulation of the anterior pituitary gland and ovaries was given during June, 1932. The estrin test performed July 15 was positive for pregnancy. Subsequent observation of the patient proved that she was not pregnant.

*Technical Errors.*—Lastly there is always a possibility of error due to faulty technic. The rabbit test is practically free from such difficulties if properly isolated rabbits of suitable age and weight are used. Friedman<sup>24</sup> has stressed the value of using the postpartum rabbit. Positive reactions are grossly visible and characteristic in appearance. When doubtful reactions are obtained, the test should be repeated before committing oneself to a definite diagnosis.

The accuracy of the estrin test depends to a considerable degree upon the ability and experience of the technician. Complete castration, elimination of mild and delayed reactions, and the avoidance of non-nucleated squamous epithelial cells in the preparation of smears will tend to decrease the possibility of obtaining false positive reactions by this test.

Because of the extremely small amount of urine necessary to produce a positive reaction, care must be taken that the syringe and needles used for consecutive tests are thoroughly cleansed before each individual injection.

#### SUMMARY

The so-called pregnancy tests are for the detection of excess quantities of sex hormones in the urine, which may occur in conditions other than pregnancy.

Among the conditions giving rise to false positives are the climacteric, primary ovarian hypofunction, ovarian cysts, hyperthyroidism, chorion-epithelioma, retained placental tissue, and malignancy.

In this series we have obtained 5.6 per cent false positives with the rabbit test and 3.2 per cent false positives with the estrin test.

The simultaneous use of the anterior pituitary and estrin tests will yield a higher percentage of correct diagnoses of pregnancy because of the low incidence of false positives with the latter.

I wish to express my indebtedness to Dr. Charles Mazer for his permission to use his private office records, his laboratory facilities, and above all for his kindly interest and helpful suggestions in the preparation of this paper.

## REFERENCES

- (1) *Mazer, C., and Goldstein, L.*: Clinical Endocrinology of the Female, Philadelphia, 1932, W. B. Saunders Co. (2) *Fluhman, C. F.*: AM. J. OBST. & GYNEC. 20: 1, 1930. (3) *Mazer, C., and Hoffman, J.*: J. A. M. A. 96: 19, 1931. (4) *Tandler, J., and Grosz, S.*: Wien. klin. Wchnschr. 21: 277, 1908. (5) *Bell, W. B.*: The Pituitary, London, 1919. (6) *Engle, E. T.*: Am. J. Physiol. 88: 101, 1929. (7) *Zondek, B., and Aschheim, S.*: Klin. Wchnschr. 7: 831, 1928. (8) *Kraul, L.*: AM. J. OBST. & GYNEC. 21: 301, 1931. (9) *Frank, R. T., and Goldberger, M. A.*: J. A. M. A. 94: 1197, 1930. (10) *Zondek, B.*: Klin. Wchnschr. 9: 1207, 1930. (11) *Hannan, J. H.*: Brit. M. J. 1: 150, 1930. (12) *Allan, H., and Dickens, F.*: Lancet 1: 139, 1930. (13) *Rowe, A. W., and Lawrence, C. H.*: Endocrinology 12: 591, 1928. (14) *Meaker, S. R.*: AM. J. OBST. & GYNEC. 20: 749, 1930. (15) *Mazer, C., and Andrussier, I.*: AM. J. OBST. & GYNEC. 22: 46, 1931. (16) *Gardiner-Hill, H., and Smith, J. F.*: J. Obst. & Gynec. Brit. Emp. 34: 701, 1927. (17) *Bram, I.*: Goiter, New York, 1924, The Macmillan Co. (18) *Stewart, W.*: Lancet 1: 1347, 1931. (19) *Weichert, C. K.*: Physiol. Zool. 3: 461, 1930. (20) *Bland, P. B., First, A., and Roeder, P.*: AM. J. OBST. & GYNEC. 23: 83, 1932. (21) *Zondek, B.*: Klin. Wchnschr. 9: 769, 1930. (22) *Zondek, B.*: AM. J. OBST. & GYNEC. 24: 836, 1932. (23) *Sussman, W.*: Brit. M. J. 2: 794, 1931. (24) *Friedman, M. H.*: Am. J. Physiol. 90: 617, 1929.

## DISCUSSION

DR. ARTHUR FIRST.—When one bears in mind the synergistic interrelationship of the anterior pituitary gland and the gonads and the thyroid and the gonads, one can readily understand the reasons for these false positive pregnancy reactions. Nature endeavors in every instance to maintain an equilibrium of its internal glandular secretions. Any deviation from the normal, whether in the form of a hypo- or hyperactivity of the gland, will cause corresponding reactions in another gland. When the function of a gland depends upon stimulation by a donor gland and the original gland is removed, it will be followed by a compensatory hyperactivity of the donor gland. Therefore, in the menopause which is characterized by a decline of ovarian activity there may follow a compensatory hyperactivity of the anterior pituitary gland with a resultant incorrect positive hormone test. Similarly primary ovarian hypofunction may yield an analogous false positive reaction.

Retention cysts of the ovary are usually due to a thickened tunica albuginea due to insufficient anterior pituitary stimulation. The increased estrin production of these cysts may thus yield a false positive Mazer-Hoffman reaction. Hyperthyroidism accelerates cellular activity throughout the body, may cause an overactive anterior pituitary gland with hyperluteinization of the graafian follicle and an excess of anterior pituitary and estrin hormone in the urine.

It may be of interest to compare our results in the Obstetrical Department of Jefferson Medical College Hospital, under Dr. P. Brooke Bland, with those of Dr. Ziserman and Dr. Mazer. In a series of 1000 hormone tests for pregnancy on problem cases, employing the Aschheim-Zondek and Mazer-Hoffman tests concurrently, we obtained 8 per cent false positive reactions with the former test and 1 per cent with the latter test.

We have a much lower percentage of correct positives than Dr. Ziserman, however, because any case which is suspicious we label as a negative reaction. Most of our false positives are from specimens sent in by the general practitioners, although more than two-thirds of the specimens were sent in by the specialist in obstetrics and gynecology.

I think we should not become too pessimistic or skeptical about these false positive reactions. Not every patient in the menopause or with hyperthyroidism will yield a positive hormone test. To illustrate this point we performed biologic tests on a series of patients who were definitely known *not* to be pregnant with the following results:

50 patients in the menopause.....	1 positive reaction.
10 patients with primary ovarian hypofunction.....	no positive reaction.
5 patients with ovarian cysts.....	no positive reaction.
5 patients with hyperthyroidism .....	no positive reaction.
5 patients with advanced malignancy.....	no positive reaction.

One patient with hyperthyroidism and primary ovarian hypofunction came to us for treatment of her sterility of nine years. She was given a tablet of progynon, 200 rats units daily, for 1 month. One month later she missed her period. A hormone test was reported positive. Did this necessarily mean that the positive reaction was false because the patient had hyperthyroidism and organotherapy? No. Subsequent developments revealed that the patient was truly pregnant.

The conclusion we should draw from this is that although we may occasionally obtain a false positive reaction, the hormone tests for pregnancy still remain a most valuable adjuvant in the diagnostic armamentarium of every qualified obstetrician and gynecologist.

DR. GEORGE M. LAWS.—It is important for us to understand the physiology involved in order that we may learn to evaluate the tests. While the percentage of false positives is small, it happens that they occur in the problem cases and, therefore, are relatively more important than the figures indicate.

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## THE RESULTS OF INTRAUTERINE CULTURES OBTAINED WITH THE SHEATH TUBE\*

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THIS communication deals with the study of intrauterine bacteriologic findings in seventy-four normal and six abnormal postpartum cases. It is based upon a similar investigation conducted by Drs. Nicholson and Evans in 1908. In fact this present effort was originally undertaken as a check-up on the earlier study. Because of improved laboratory technic and better knowledge in the field of bacteriology in the past twenty years, it was felt that a check-up conducted at the present time might show results different from those obtained in earlier days. This study was conducted on the Dr. Wm. R. Nicholson service at the Graduate Hospital, Philadelphia.

For the purpose of this study we have defined a normal case as one which runs an afebrile postpartum course with no instrumental or manual interference during labor, other than cases delivered by low outlet forceps.

The method of obtaining the intrauterine cultures was as follows: With the patient in the lithotomy position and the external genitalia carefully cleansed, a Sims' speculum exposed the cervix which was also cleansed with bichloride. The Nicholson culture collector with cap closed was inserted into the uterine cavity. The cap was

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\*Read before the Philadelphia Obstetrical Society, December 1, 1932.

opened by pushing the tube into the cavity of the uterus and as much lochia as possible was sucked into the glass tube with a syringe. The glass tube was then withdrawn until its end was engaged within the metal tube and both were simultaneously withdrawn from the patient. The ends of the glass tube were sealed with wax and the tube was sent to the laboratory where it was washed in bichloride before the ends were broken and cultures made.

The first twenty cases were cultured in this manner. On several occasions we received reports from the laboratory of contaminations, which we were unable to explain. Our thought is that in these cases we failed to pull the glass tube into the lumen of the sheath before withdrawing the entire instrument from the uterine cavity, thus exposing the end of the glass tube to the bacterial flora of the endocervix and vagina.

To overcome this, we have somewhat modified the metal sheath, so that the all-important flanged metal cap is opened and closed by operating a thumb screw placed on the handle of the instrument. Thus the top of the metal sheath is closed when the instrument is withdrawn as well as when it is introduced into the uterus.\*

It also became apparent that the transportation of glass tubes from ward to laboratory and back would result in considerable loss and breakage if a large series of cultures were to be studied; in the interest of economy and efficiency therefore, we further modified our earlier procedure by transferring as much lochia as we collected directly from the glass tube into the test tube containing the sterile brain broth after properly flaming the top of the test tube as well as the end of the culture tube. These sterile containers of brain broth and lochia were then sent to the laboratory for study. Dr. Boerner, in charge of laboratories at the Graduate Hospital, personally did the actual laboratory work and only his help and full-hearted cooperation made the investigation possible.

Cultures were taken in three periods of the puerperium: First, during the first three days, second, from the fourth to the sixth day, and third, from the seventh to the tenth day postpartum; thus three cultures were taken from each patient except in several instances and a total of 231 cultures were studied.

TABLE I. CULTURES FROM CASES IN WHICH MEMBRANE RUPTURED FOUR HOURS OR LONGER BEFORE DELIVERY

LENGTH OF TIME MEMBRANE RUPTURED BEFORE DELIVERY	TOTAL	CONDITION OF CULTURES				
		BACTERIA PRESENT IN ONE OR MORE CULTURES				ALL CULTURES STERILE
		TOTAL	IN ONE ONLY	IN TWO ONLY	IN THREE	
Total	23	6	5	1		17
Four and less than five hours	8	4	4			4
Five and less than six hours	3					3
Six and less than seven hours	5	1	1			4
Eight and less than nine hours	1	1		1		
Twelve and less than thirteen hours	1					1
One and less than four days (One to two days)	2					2
Four and less than seven days (Four to six days)	3					3

\*Instrument made by Pilling of Philadelphia.



TABLE II. CULTURES FROM ALL CASES OF NORMAL DELIVERY ACCORDING TO LENGTH OF TIME MEMBRANE RUPTURED BEFORE DELIVERY

TYPE OF CASE	TOTAL	CONDITION OF CULTURE				
		BACTERIA PRESENT				STERILE
		TOTAL	IN ONE ONLY	IN TWO ONLY	IN THREE	
Total	74	20	15	4	1	54
Membrane ruptured in less than four hours	51	14	10	3	1	37
Membrane ruptured in four hours or longer	23	6	5	1		17

The presence of a thin grayish membrane over the cervix in all puerperal cases, described by Dr. Goodall, is not confirmed by our study. We had occasion to observe the cervix every time a culture was taken and yet not in a single instance was this membrane seen.

Of the twenty positive cultures studied in a total of 74 normal deliveries, one case showed positive cultures in all three periods. This patient (Case 12) had sapremia or lochial block and the organism found was the *Staphylococcus albus*.

We had four cases in this group with positive cultures in two periods. Two of those cases (Cases 46 and 61) had almost total suppression of lochia with moderate elevation of temperature. The offending organism in both these cases was the *Staphylococcus albus*. The other two cases belonging to this group were positive because of error in technic. In one patient (Case 10) the first culture showed *Bacillus alkaligenes* and the break in technic occurred when the lochia was transferred from the glass tube to the test tube containing the brain broth. The second culture of this same patient was vitiated because the patient was extremely uncooperative at the time. The organism in this instance was the *Staphylococcus albus*.

The organisms found in the fourth patient (Case 19) were *Staphylococcus aureus* on the first culture and *Staphylococcus albus* and *Bacillus proteus* on third culture. Both were contaminations and are so noted in our notes at the time the cultures were taken.

The other positives noted in this normal group showed a wide variety of nonpathogenic organisms and were the result of errors in technic either noted at the time of culture or in the laboratory.

We report all these cases without deletion or corrections, exactly as the reports came from the laboratory, not only for scientific accuracy but because we wish to lay particular emphasis on the fact that absolutely scrupulous care must be exercised in this work. In other words all our cultures in this group of seventy-four cases, taken during three periods of the puerperium with the exception of the scattered contaminations just described, showed sterile intrauterine cultures.

The remaining six cases studied were problems for diagnosis. In detail they are:

CASE 1.—Thirty-six years of age, para xi, white. Delivered spontaneously. One vaginal during labor, under strict asepsis, membranes ruptured thirty-five minutes before delivery. No lacerations. Two days later her temperature was 104°, pulse 116, respiration 36. Intrauterine culture showed *Streptococcus hemolyticus*. Seven days later a blood culture showed the presence of the same organism in the blood.

CASE 34.—Twenty-two years, para i, white. Delivered by manual dilatation of cervix with decomposition of breech. After delivery she had chills and fever, the temperature going as high as 106°. Intrauterine culture was negative. The patient died of septic thrombophlebitis and pneumonia. This was proved by a postmortem examination.

CASE 35.—Twenty-seven years, para ii, colored. Admitted to Graduate Hospital with history of miscarriage five weeks ago. Febrile since that time. Intrauterine culture four days after dilatation and evacuation, showed *Bacillus coli*; the intrauterine debris showed a tuberculous condition.

CASE 37.—Thirty-six years, para viii, white. Postabortal chills and fever. This patient was packed before her admission to the Graduate Hospital. Intrauterine culture showed *Streptococcus hemolyticus*.

CASE 51.—Nineteen years, para i, colored. Packed for postpartum hemorrhage moderate elevation of temperature. Intrauterine culture showed *Streptococcus hemolyticus*. The blood cultures in Cases 37 and 51 were negative on repeated examinations, but both patients had a stormy convalescence and were diagnosed clinically as cases of septicemia. Both these cases recovered.

CASE 67.—Nineteen years, para i, colored. Three vaginal examinations during labor, high forceps, third degree laceration. Febrile postpartum cultures were all sterile. The case proved to be one of pyelitis.

Of the eighty cases studied, seventy-three were examined vaginally, one to six times during labor, under strict aseptic precaution, of course. It is rather significant that these examinations had no effect on the intrauterine bacterial content. We explain this on the grounds that our service insists on thorough and most careful scrubbing of external genitalia immediately before each vaginal examination of a patient in labor.

#### SUMMARY AND CONCLUSIONS

1. The germ content of the uterus has been controversial ground for years and we fear it is going to continue so until a faultless technic is devised in the taking and study of these cultures.

2. Extreme care must be exercised in taking of cultures with the technic that we adopt and note immediately all error in technic at the bedside or in the laboratory, so that the results may be correctly interpreted.

3. The uterine lochia is sterile in normal postpartum cases. Contrary to common belief, the length of time of the rupture of membranes before delivery does not affect this result.

4. Intrauterine cultures during the puerperium materially assist in a diagnosis of sepsis.

5. The presence of the streptococcus group in the uterus has always given constitutional evidence of infection and therefore it is our belief that this organism in the uterine cavity always gives symptoms and it is not a saprophite.

6. We have seen no grayish membrane lining the cervix in any of our cases. We therefore, cannot confirm the statement that this membrane is of common occurrence.

7. Our study fully confirms the conclusions reached by Drs. Nicholson and Evans in their investigation of the same subject.

263 SOUTH TWENTY-SECOND STREET.

#### REFERENCES

*Nicholson, W. R., and Evans, J. S.*: Am. J. M. Sc. 136: 255, 1908. *Goldsborough, F. C., and Roman, B.*: N. Y. State J. M. 24: 721, 1924. *Fitzgibbon, G., and Bigger, J. W.*: Brit. M. J. 1: 775, 1925. *Fitzgibbon, G.*: Brit. Med. Press 120: 49, 1925. *Fitzgibbon, G., and Bigger, J. W.*: Brit. J. Obst. & Gynec. 32: 298 and 773, 1925.

#### DISCUSSION

DR. FREDERICK BOERNER.—First I want to make it clear that the main object in these studies was, primarily, to detect streptococci if present, and secondarily to detect any other aerobic organisms that might be present. For the original cultures we used Rosenow's brain broth. If growth appeared subcultures were made on blood agar plates and the organisms present were further studied for identification. We did not attempt to culture for anaerobic organisms so those cases reported as sterile were only sterile so far as aerobic organisms were concerned.

DR. T. L. MONTGOMERY.—To what extent bacteria invade the uterine cavity and grow after the delivery is a much disputed question. Dr. Jaffe's careful work in collecting specimens of intrauterine fluid from normal patients at successive periods after delivery throws valuable light upon the question. His results agree rather closely with those obtained a few years ago by Dr. Nicholson, using a somewhat similar apparatus. Their cultures indicate that after spontaneous delivery and during a normal puerperium, bacteria do not frequently invade the uterus.

These findings are quite at variance to those reported by certain other investigators, particularly the group at Johns Hopkins. In fact, the general consensus of opinion is that bacteria can be detected in the cavity of the uterus within forty-eight hours after delivery. The very evident difference of opinion on the matter simply indicates that the problem is by no means a settled one, and that as rapidly as new methods of collecting specimens are devised, and new bacteriologic culture media and methods are employed, different findings will be reported.

We have made the practice in the Obstetric Department of the Jefferson Medical College Hospital of culturing the lochia in all instances where a temperature of 100.4° F. or higher was sustained for more than two days after delivery, when the cause of the morbid reaction was not evident to the ordinary methods of examination. Our findings, naturally, have no bearing on the problem of the normal case. In Dr. Jaffe's report, however, I notice there is no reference to the finding of anaerobic bacteria and I wonder if special methods were used for the culturing of this type of organism which Dr. Williams considered so frequent a cause of puerperal morbidity.

Dr. Jaffe also states that he finds no relationship between premature rupture of the membranes and the presence of bacteria in the puerperal uterus. We have

studied this question from the standpoint of the histologic examination of the placenta. In a series of 500 placentas we found inflammatory reaction in the membranes, margin of the placenta or cord vessels in over 10 per cent. In many of these we were able to demonstrate the presence of bacteria by special tissue staining methods. Upon examining the histories in this group we found that most of the cases occurred in instances where the labor was long and tedious and terminated by vaginal operative delivery, or when the membranes had been ruptured for long periods of time.

DR. J. K. JAFFE.—In reporting sterile intrauterine cultures in the cases where the membranes ruptured four hours or longer before delivery, it must be remembered that this entire series consisted of only 23 cases. We cannot draw definite conclusions from so small a series. In view of our findings, however, the subject deserves further investigation.

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## THE INFLUENCE OF FEMALE SEX HORMONE UPON BLOOD COAGULATION OF THE NEWBORN\*

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FROM the original report of Birch,<sup>1</sup> and recent articles of Kimm and Van Allen,<sup>2</sup> Kugelmass,<sup>3</sup> and others, it appears that true hemophilia in male children may be prevented or benefited by administration of ovarian substance. These results are based upon the fact that male individuals normally produce in very small amount a hormone identical with the female sex hormone, but fail to do so in hemophilia.

Most of the reported results in the treatment of bleeders with estrin or female sex hormone have been obtained by the use of unfamiliar or unstandardized ovarian products, and none have included the action of estrin in hemorrhagic disease of the newborn, in whom the concentration and effects of estrin present especially interesting and important features.

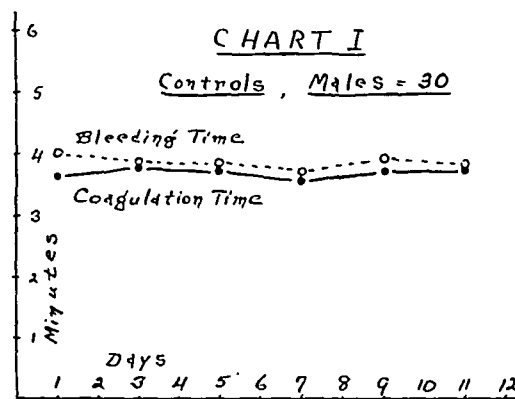
Each fetus is permeated with maternal estrin at birth, so that much of the hormone can be recovered from the umbilical blood, and in the first few days of life from the urine. Activity of this large quantity of estrin before it is eliminated by excretion through the kidneys and bowel is expressed in accumulation and secretion of colostrum in the breasts of both sexes, and by greater development of the uterus (sometimes associated with uterine bleeding) in the newborn female than in the infant of twelve months.

The present report is offered for the purpose of showing the effect of certain standardized preparations of estrin upon normal newborn infants, and upon several abnormal infants, including one case of moderate hemophilia. The study of each group consisted mainly in

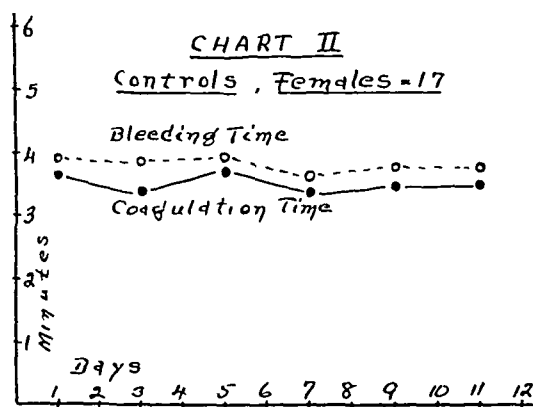
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\*Read at a meeting of the Obstetrical Society of Philadelphia, December 1, 1932.

noting the duration of bleeding without pressure from heel punctures, and the time required for coagulation of blood drawn into uniform machine-made capillary tubes. While the tube method is admitted to be relatively crude, Dr. Stuart C. Runkle, Jr., who performed all of the tests, was able to complete his observations with a minimum of variation. In addition to the above, each infant was examined particularly for engorgement of the breasts, icterus and vaginal or other bleeding.



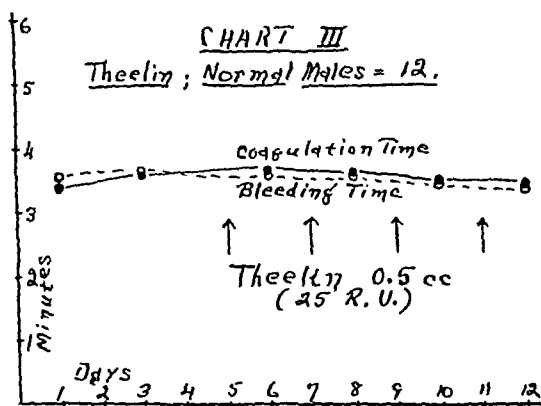
*Group I.*—This group included 47 consecutive control infants, 30 male and 17 female through the courtesy and from the service of Dr. William R. Nicholson under conditions identical with the test babies. The average weight of the infants was 7 pounds 10 ounces, only two below 6 pounds; all were breast fed and all were discharged from the hospital in good condition without intercurrent complications of any sort.



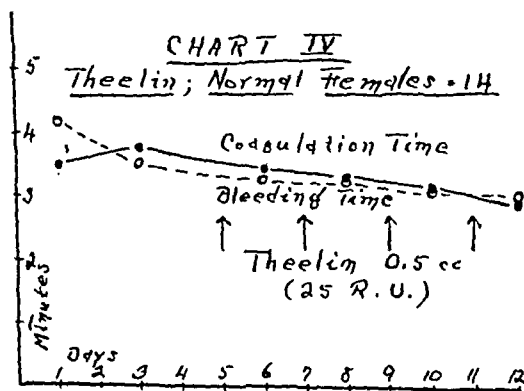
*Results:* Both males and females showed very straight bleeding and coagulation curves as shown in Charts I and II. Thirty-six per cent of the infants had enlargement of the breasts; 8 males and 5 females showing moderate breast engorgement, while 2 males and 1 female showed severe engorgement, 2 cases noted on the first day,

5 on the second, and 7 on the third day. Only 2 babies (both males) presented frank icterus among the 47 control infants, and none showed vaginal or other bleeding.

*Group II.*—Twenty-six newborns, 12 males and 14 females, were injected with estrin in the form of 0.5 c.c. (labeled 25 R.U. and containing probably 10 to 15 R.U.) of theelin every other day from the fifth day after birth. The average weight of these infants was 7 pounds 11 ounces, only one below 6 pounds, all but one were breast fed, and all but two were discharged in excellent shape without complications of any sort.



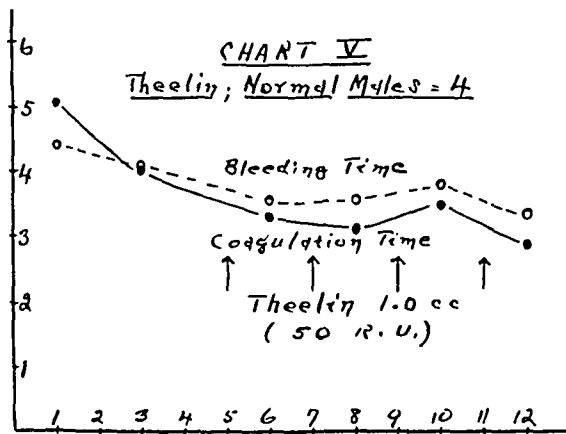
*Results:* The males showed normal straight bleeding and coagulation curves as shown in Charts III and IV, but the females showed a gradual but definite reduction of each curve from four to three minutes. Thirty-four per cent of this group showed enlargement of the breasts as follows: no males, but 6 females had moderate breast en-



gorgement, while in 1 male and 2 females there was excessive engorgement, in most instances following the initial theelin injection and increasing with subsequent injections. Two babies (a male and a female) showed icterus, the former but slightly, which parallels the incidence of icterus in the control group, in which the discoloration was manifest mostly by the third day. The female with decided

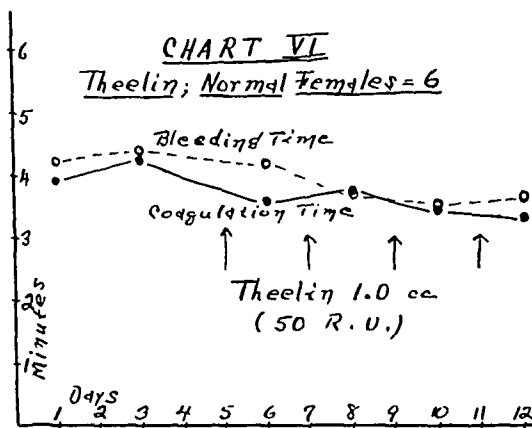
icterus from the second to the seventh day cleared completely after two injections of theelin. One infant showed definite vaginal bleeding after two injections of 0.5 c.c. of theelin, which continued for one day only and did not reappear after three more injections.

*Special Cases.*—One female bottle-fed infant received 9 injections of 0.5 c.c. of theelin in eighteen days without further reduction of the bleeding and coagulation curves after a moderate early drop. An-



other baby suffering with congenital stricture of the bowel received an infusion of calcium gluconate and glucose along with theelin without change in its low blood curves.

*Group III.*—Ten infants, 4 males and 6 females, were injected every other day from the fifth day of birth with 1.0 c.c. of theelin labeled 50 R.U. and probably containing about 25 R.U. Their weights aver-

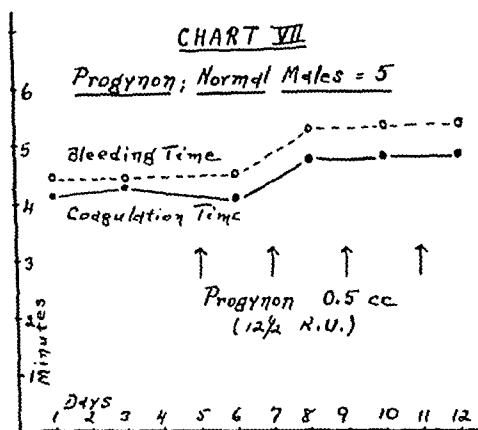


aged 6 pounds 12½ ounces, only one was below 6 pounds, all were breast fed and all discharged without complications in good condition.

*Results:* Both males and females showed gradual declines in coagulation and bleeding curves (Charts V and VI). Eighty per cent of these infants had enlargement of the breasts; 1 male and 6 females presented moderate breast engorgement, and one female severe en-

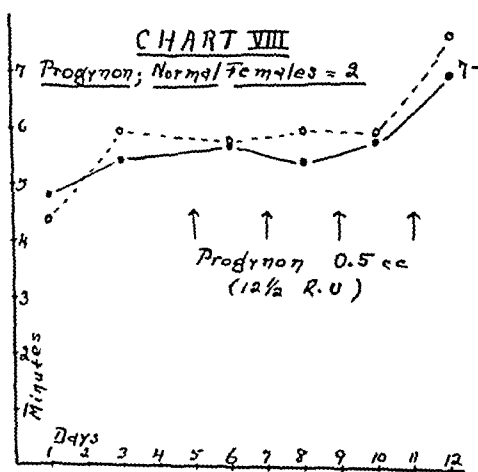
gorgement, in each case increasing with further injections. Two females were icteric, one after the first injection on the fifth day, and one by the third day, before injection, each entirely cleared by the third injection, in less than the usual time.

*Group IV.*—Seven newborns, 5 males and 2 females, were treated with injections of 0.5 c.c. of progynon labeled  $12\frac{1}{2}$  R.U. (probably containing 6 or 8 R.U.) every other day from the fifth day after birth.



These babies averaged 7 pounds 5 ounces, were all breast fed and discharged from the hospital in excellent condition without complications.

*Results:* Coagulation and bleeding curves (Charts VII and VIII) showed decided elevation in both males and females, the latter increased nearly three minutes. One female showed moderate breast



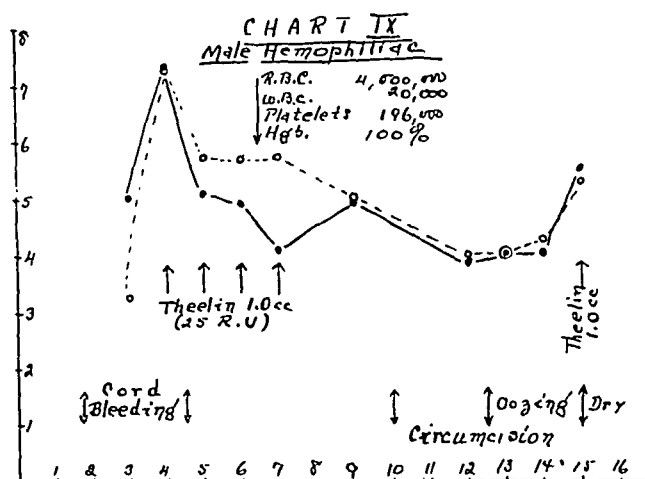
engorgement, and two males marked engorgement, especially following the first progynon injection. Icterus and vaginal (or other) bleeding did not appear in this small group.

*Group V.—Special Cases:* 1. Hemophilia of very mild degree in a male infant born to a woman in whose family there have been many persistent bleeders, including a recent nephew who required several



transfusions in the first weeks of life. The record of this infant as charted is self-explanatory, but heretofore I would not have permitted circumcision under the circumstances. This infant, followed since discharge from the hospital, is in good condition, and no further bleeding has occurred to date (aged two and one-half months).

2. Case of "idiopathic" bleeding from the pharynx in a large female newborn.



- Nov. 4, 1932, Vomited large quantity of bloody mucus, third day after birth.
- Nov. 5, 1932, Bleeding from nose. Coagulation time 4 min. 10 sec.; bleeding time 3 min. 10 sec. 1 c.c. theelin (50 R.U.) injected.
- Nov. 6, 1932, Profuse spontaneous vaginal bleeding. Coagulation time 4 min. 0 sec., bleeding time 3 min. 5 sec. 1.0 c.c. theelin injected.
- Nov. 6, 1932, Less profuse vaginal bleeding. Coagulation time 3 min. 5 sec., bleeding time 3 min. 9 sec. 1.0 c.c. theelin injected.
- Nov. 8, 1932, Same vaginal bleeding. Coagulation time 4 min. 10 sec., bleeding time 3 min. 5 sec. 1.0 c.c. theelin injected.
- Nov. 9, 1932, Very slight vaginal bleeding. No injection. Coagulation time 3 min. 5 sec., bleeding time 3 min. 7 sec.
- Nov. 10, 1932, Very slight vaginal bleeding. No injection. Coagulation time 3 min. 25 sec., bleeding time 3 min. 2 sec.
- Nov. 11, 1932, No vaginal bleeding. No injection. Coagulation time 3 min. 5 sec., bleeding time 3 min. 1 sec.
- Nov. 16, 1932, No bleeding. Coagulation time 3 min. 23 sec., bleeding time 3 min. 29 sec. 1.0 c.c. theelin injection.
- Nov. 17, 1932, No bleeding. Coagulation time 3 min. 5 sec., bleeding time 2 min. 35 sec. 1.0 c.c. theelin injected. Discharged recovered. No further bleeding to date (Nov. 29, 1932).

*Comment.*—Careful study of this infant failed to diagnose the type of bleeding from the respiratory tract, but the uterine bleeding was probably directly due to the theelin administration. It is possible that variations of estrin in newborns may account for certain hemorrhagic manifestations in each sex, even with relatively low bleeding and coagulation levels.

3. Top normal coagulation time in a healthy male infant reduced from five minutes to three minutes by injection of 1.0 c.c. of theelin daily for three days.

#### SUMMARY AND CONCLUSIONS

1. Normal coagulation and bleeding times of both male and female newborn infants are nearly constant between three and one-half and four minutes for the first eleven days.

2. Injection of solution of crystallized estrin (theelin) produced a moderate reduction of the blood curves in normal males and females.

3. Injections of progynon were followed by a definite increase of bleeding and coagulation times in normal newborns of both sexes.

4. Abnormally long coagulation and bleeding times, as well as spontaneous bleeding other than vaginal were corrected by injections of theelin.

5. Breast engorgement in both sexes was produced by injections of female sex hormone indicating a direct effect of estrin upon the newborn breasts rather than an indirect result through the activation of a prepituitary specific hormone.

6. Vaginal (uterine) bleeding was initiated by estrin administration.

7. Icterus neonatorum appeared to clear up more rapidly than usual, under injections of theelin. (Tests are now under way to ascertain whether icterus may be prevented by early administration of estrin.)

#### REFERENCES

- (1) *Birch, C. L.*: J. A. M. A. 97: 244, 1931. (2) *Kimm, H. T., and Van Allen, C. M.*: J. A. M. A. 99: 991, 1932. (3) *Kugelmass, N.*: J. A. M. A. 99: 895, 1932.

1918 PINE STREET.

#### DISCUSSION

DR. HOWARD CHILDS CARPENTER.—The apparatus used for determining the coagulation is not so important, as they are all inaccurate, but the important thing in a comparative study is to have a uniform technic and the same operator.

It has been estimated that 1 per cent of newborns have spontaneous bleeding between the fourth and tenth day in some part of their body tissues. The frequent occurrence of intracranial hemorrhage, as shown in necropsies, compared with the rarity in other statistical tables, suggests that it is frequently undiagnosed. It would therefore seem that a routine test of the coagulation and bleeding time of two-day-old newborns is a desirable procedure, surely for all newborns who present unusual symptoms at birth.

The uncertainty of the occurrence of an internal hemorrhage and also the degree of its severity, make it always a matter of concern. Also there is a tendency for hemorrhages to recur; therefore the urgency is not only for prompt, but continued treatment.

Quantitative and qualitative dietary deficiencies reduce the production of certain hormones. A deficiency of vitamin F in the diet of the pregnant woman has caused hemorrhage in the newborn; on the other hand, a maternal diet containing adequate amounts of protein and fat will shorten the clotting time.

We suggest, instead of giving a 5 per cent glucose solution to the newborn until the breast milk arrives, to use a diluted solution of evaporated milk, but not to use condensed milk. Baginsky, long ago, recommended the administration of gelatin to the newborn to reduce clotting time. It may be administered in a 3 per cent solution as a diluent for the evaporated milk.

A hemophiliac boy at present in my ward was admitted with a massive hemorrhage in his leg and bleeding from the gums. With the second injection of theelin the bleeding was arrested. The coagulation time was reduced from an hour and twenty minutes to twenty-one minutes in seven days. Female sex hormone seems to be a specific in the treatment of hemophilia. Today the hemophiliac has been placed in the same class as the diabetics or the cretins who may continue to enjoy life, as long as they are able to procure the specific hormone.

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## THE IMPORTANCE OF THE PULSE RATE IN LABOR\*

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THE basis for this study was a review of a series of case records of private patients prior to 1926. In this analysis three facts were most convincing:

First—That patients who delivered normally would usually have a pulse rate consistently below 100 and would exhibit a normal condition throughout their stay in the hospital and subsequent postnatal period.

Second—That in those patients where operative delivery proved necessary, the same uneventful convalescence could be secured if the pulse rate could be kept below 100.

Third—Elevation of the pulse rate above 100 was found to result from insult whether medical, surgical, or obstetrical in type.

This caused us to conclude:

First—That the successful termination of labor depended upon management.

Second—That from the time the patient entered the hospital, was delivered, and returned to her room, the pulse rate should be 100 or less. We have not been able to attain this goal at all times. However, the closer we have adhered to this ideal the more we have been convinced of its importance.

In 1926 I began a second series of cases in an attempt to evaluate the importance of the pulse rate in labor. Fourteen hundred and sixty-four consecutive private cases are now available for study. Of this number 1400 were occiput presentations. The remaining 64 received the same care but time and space prevent a separate analysis. Patients cared for in consultation, or neglected cases referred to us in the hospital, and a few records with insufficient data are not included in this series.

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\*Read at the Fourth Annual Meeting of the Central Association of Obstetricians and Gynecologists, Memphis, Tenn., September 15-17, 1932.

With few exceptions, patients were cared for during the prenatal, natal, and postnatal periods. Ninety per cent were examined at the second, fourth, and sixth postnatal months, and the remaining 10 per cent were examined at least once postnatally. Each patient was studied for length of labor, type of delivery, relief of pain, management of the third stage of labor, pelvic damage, and postnatal care.

TABLE I. MATERNAL PULSE RATE

POSITION	BEFORE DELIVERY				AFTER DELIVERY			
	TOTAL	70's	80's	90's	ABOVE 100 (AV.)	80's	90's	ABOVE 100 (AV.)
<i>Para i</i>								
L.O.A.	318	182	68	25	43-110	132	95	91-116
R.O.A.	76	40	10	14	12-110	36	20	20-120
L.O.P.	89	32	17	16	24-114	30	17	42-122
R.O.P.	205	88	44	33	40-122	48	63	94-114
<i>Multipara</i>								
L.O.A.	329	209	63	32	25-110	204	74	51-128
R.O.A.	93	58	15	11	9-114	50	21	22-120
L.O.P.	81	41	13	12	15-118	35	20	26-118
R.O.P.	209	131	34	19	25-110	88	70	51-106

## SUMMARY

TOTAL CASES	BEFORE DELIVERY				AFTER DELIVERY		
	70's	80's	90's	ABOVE 100 (AV.)	80's	90's	ABOVE 100 (AV.)
1400	781	264	162	193-115	623	380	307-118
	55.8%	18.85%	11.57%	13.78%	44.5%	27%	28.5%

TABLE II. DURATION OF LABOR

POSITION	TOTAL	FIRST STAGE	SECOND STAGE	THIRD STAGE	AVERAGE TOTAL LENGTH OF LABOR
<i>Para i</i>					
L.O.A.	318	10 hr. 38 min.	1 hr. 16 min.	19 minutes	10 hr. 13 min.
R.O.A.	76	9 hr. 50 min.	1 hr. 5 min.	24 minutes	11 hr. 19 min.
L.O.P.	89	16 hr. 4 min.	1 hr. 38 min.	24 minutes	18 hr. 6 min.
R.O.P.	205	20 hr. 8 min.	1 hr. 52 min.	45 minutes	22 hr. 45 min.
<i>Multipara</i>					
L.O.A.	329	6 hr. 38 min.	39 minutes	16 minutes	7 hr. 33 min.
R.O.A.	93	6 hr. 38 min.	51 minutes	19 minutes	7 hr. 48 min.
L.O.P.	81	8 hr. 38 min.	48 minutes	17 minutes	9 hr. 43 min.
R.O.P.	209	9 hr. 7 min.	51 minutes	21 minutes	10 hr. 19 min.

## DURATION OF LABOR

From Table II will be noted the different positions with the average duration of labor in each. We estimated the duration of labor from the time that progressive dilatation could be determined. A study of the mechanism and progress of labor showed that in most cases labor is a normal physiologic process. It was evident that the time element, pain, and the ability to wait were the all important factors in management. Prenatal care determined the possibilities of the natal period;

and the maternal pulse rate of 100 or less and normal fetal heart tones indicated the safety of the mother and child. Pain then was our most difficult problem, not only because of the fact that the public has been taught that labor can be shortened and pain eliminated but because of the clinical effect of pain upon the patient. We have therefore been interested not so much in methods that shorten labor as in those safe methods that modify pain.

From the time the patient entered the hospital in labor, was delivered, and was returned to her room, we endeavored to maintain a pulse rate of 100 or less. To do this, the time factor was forgotten and pain was relieved in keeping with the pulse rate. In a former series there were two patients who had convulsions that, from all obtainable information, could be attributed only to pain and exhaustion. I have observed hysterical manifestations are often caused by pain, and definite neuroses originated in labors in which pain was not controlled.

On the other hand, sedatives and anesthetics, when given in too large quantities or over too long periods have produced conditions equally alarming. Labors have been lengthened and we have seen changes in the maternal pulse rate and fetal heart tones that produced unnecessary alarm and interference. The difficulty then was to estimate and utilize the physiologic possibilities of the patient without producing pathologic sequelae. It was very evident from clinical manifestations in the hospital stay and the postnatal period, that the manner in which pain was relieved determined the ultimate recovery of the patient and, therefore, the success of our management of the labor.

#### TYPE OF DELIVERY

We confess we have been influenced by those who maintain that, since the present-day women demand a shorter labor, the obstetrician should defer to their wishes. But the most outstanding influence has been the delusion that low forceps and episiotomies can be done with safety. The effects of this delusion were seen in the postnatal results observed in the first five or six hundred cases. In our clinical work interference has been so low as 10 per cent and never as high as in our private practice. We have attempted to excuse such a difference on the basis that private patients were different from clinical patients. Yet, if the teaching is followed that interference is indicated only in the interest of the mother or child, two factors obtain in all types of patients. First, the only clinical criterion we have to the condition of the mother, is her pulse rate. Second, the character of the fetal heart is the only known guide to the safety of the child. When these guides were followed, the management of labor in clinical and private patients was essentially the same. (Table III.)

Little excuse can be given for such a large number of midforceps deliveries. In many cases by ironing out the perineum or by aiding ro-

tation, the station was changed and, though the problem had been that of low forceps, yet application was at the midstation and must be classified as a midforceps delivery. Seventy-five versions in such a small series of cases would seem entirely too high. With 40 per cent occiput posterior presentations and a large number of occiput transverse arrests, we believe the majority of versions were indicated. While we have done many versions through the years, nevertheless, we believe that the dangers should prevent the use of this method in all cases where the necessity is not clearly indicated.

By following the pulse rate more closely we were led to lessen all forms of interference, especially in multiparae. We formerly were too much influenced by the misconception that multiparae demand less pain and shorter labors and by the seeming ease with which forceps could

TABLE III. TYPE OF DELIVERY

POSITION	TOTAL	SPONTANEOUS	LOW FORCEPS	MID- FORCEPS	HIGH FORCEPS	VERSION
<i>Para i</i>						
L.O.A.	318	205	84	18	1	10
R.O.A.	76	41	31	2	1	1
L.O.P.	89	24	32	22	1	10
R.O.P.	205	73	75	43	1	13
<i>Multipara</i>						
L.O.A.	329	250	64	12	0	3
R.O.A.	93	65	20	4	0	4
L.O.P.	81	43	17	8	0	13
R.O.P.	209	116	61	21	0	11
SUMMARY						
TOTAL CASES	SPONTANEOUS	LOW FORCEPS	MID- FORCEPS	HIGH FORCEPS	VERSION	
1400	817—58.4%	384—27.4%	130—9.3%	4—0.3%	65—4.6%	

be done. We now believe that, independent of parity or social status, the expectant mother is interested only in the final outcome, and that her attitude toward labor, especially toward interference, is that of her obstetrician.

The management of occiput posterior presentation and deep transverse arrest was the cause of a large part of our interference. An attempt was made to attain the basic essentials of complete dilatation, low station, complete flexion, and rotation. With complete dilatation, but without rotation, if no progress occurred within one hour, and if the pulse rate were as high as 100, a manual rotation was done under gas anesthesia. By following this practice we succeeded in obtaining a spontaneous delivery in 50 primiparae and we now believe others might have been delivered spontaneously had sufficient time been given. A few rotations were done at the midstation when progress was materially delayed, with the patient delivering normally or the presenting point coming down to a low station, making low forceps delivery possible.

Many mental hazards arise when hours have passed with seemingly little progress. The anxiety of friends and relatives may become infectious, and may cause fear rather than reason to direct the course of the delivery. But hours of observation lead to an appreciation of the normal mechanism of labor. Prenatal knowledge that the expectant mother can give birth to her child and the assurance gained from a normal fetal heart and a maternal pulse rate below 100, eliminate fear and make waiting possible. Five hundred and eighty-four occiput posterior presentations were cared for by following these three principles. From our observations of both natal and postnatal results we are becoming more convinced that the only real difference between the management of occiput anterior and occiput posterior positions is the time element, and that the ability to wait patiently is the determining factor in the successful termination of each case. Such waiting can be done intelligently only with adequate knowledge of the patient's well-being as gleaned from close observation including the pulse rate.

#### THIRD STAGE OF LABOR

Much information was gained from the management of the third stage of labor. The pulse rate was always an infallible guide to the tone, action, and reaction of the uterus, and to final results. If a pulse rate of 100 or less had been maintained, normal contractions returned within a short time and placental separation occurred within the first ten minutes. Loss of blood was reduced to the standard advocated by Calkins, and only gentle force was necessary for the expression of the placenta. In such cases there would not be as much as ten points variation in the pulse rate. On the other hand, with a pulse rate of 100 to 120, from too early attempts at expression of the placenta, or from using undue force, thus adding further tissue insult, the patient would show excessive loss of blood or even shock with alarming changes in the blood pressure and pulse rate. In a few cases the result of such management was to be seen throughout the first week in the hospital. In several patients of this series who were returned to their room with a pulse rate of 100 to 120 after delivery, the cause was traced to poor management of the third stage of labor. Such cases emphasize the importance of a pulse rate continuously below 100 as a guide to safety, and the increasing dangers of too early expression of the placenta. It would seem then that the proper management of the third stage of labor can best be judged by a pulse rate of 100 or less.

#### PELVIC DAMAGE

A record was made in all cases in which no damage was recorded at the time of delivery and compared with postnatal findings. We feel that these findings disprove the statement so often made that there can be pelvic damage not seen at the time of delivery. This observation has been of special importance, since this teaching has been one of the arguments advocated for routine episiotomy. (Table IV.)

There were 746 episiotomies and tears, many of this number representing the influence of the "routine episiotomy" doctrine. Tears extended beyond the episiotomy frequently, and while the pubococcygeal-spinster ani relationship was seldom involved, yet in many instances the fascia was damaged. Therefore, we did an anatomic second degree repair after each episiotomy and classified them as second degree tears. There were 10 third degree tears. The rectum itself was involved in only 2 cases, but in all 10 the sphincter muscle was damaged, which necessitates the third degree classification. If the anesthetist reported the pulse rate at the beginning of the repair and at the completion, the pulse rate would often show an increase of as much as ten to forty points.

With proper management of the first stage of labor, and with a trained obstetric anesthetist to assist in the second stage of labor, there

TABLE IV. PELVIC DAMAGE

POSITION	TOTAL CASES	NO DAMAGE	SECOND DEGREE	THIRD DEGREE
<i>Para i</i>				
L.O.A.	318	126	188	4
R.O.A.	76	28	47	1
L.O.P.	89	25	62	2
R.O.P.	205	62	140	3
<i>Multipara</i>				
L.O.A.	329	190	139	0
R.O.A.	92	49	44	0
L.O.P.	81	38	43	0
R.O.P.	209	126	83	0

## SUMMARY

TOTAL CASES	NO DAMAGE	SECOND DEGREE	THIRD DEGREE
1400	644—46%	746—53.3%	10—0.7%

should be little change in the pulse rate. The perineal stage most often tests the skill of the obstetrician, but waiting will lessen the indications for an episiotomy. It is true that labor can be shortened by an episiotomy and it is also true that an episiotomy is frequently indicated; yet if a postnatal comparison is made of one thousand cases in which there has been no damage with those in which a routine episiotomy has been done, the difference will be appreciated. From the reports of the White House Conference, it is very evident that attempts to shorten labor with the inevitable pelvic damage are playing an important part in American obstetric morbidity and mortality.

## AFTER-CARE

After delivery we have followed a routine of putting a warm blanket over the patient and waiting for complete consciousness before disturbing her in any way. Vomiting seldom occurred and with a well-contracted uterus, bleeding was reduced to a minimum. If absolute rest was then maintained for twenty-four hours, the puerperium would, in



most cases, be normal. If, during labor or during delivery, the pulse had reached 120 for a short time, it would usually return to normal before the patient had been returned to her room. If a pulse rate of 100 or less had been maintained throughout labor, the first week of the puerperium was quite characteristically uneventful. The patients ate and slept well, involution was rapid, and tissue healing was most satisfactory. Catheterization was seldom necessary and few laxatives were required. Most marked was the lack of discomfort and the patient's desire for early exercise. If a repair was done, there was little discomfort or swelling. In other words, if the physiologic balance of the patient had been maintained as expressed by the normal pulse rate of 100 or less, complications of the puerperium were seldom seen. Furthermore tissue reaction and regeneration were found to be in keeping with a continual pulse rate of 100 or less. Most of our cases were examined at the second, fourth, and sixth postnatal months and, in many, the type of labor would be evident in the reparative processes and the ultimate condition achieved.

#### OTHER CONSIDERATIONS

Few reports are seen from private practice, and I am not certain but that our greatest abuses are to be found in this field. With limited supervision of hospital staffs, much depends upon the integrity and training of the obstetrician. The willingness and ability to observe closely the progress of individual labors should be the measure of good obstetrics.

Divided interest in medicine offers a serious question to be answered. I refer to the combining of other branches of medicine with obstetrics. Only recently, a very well-known obstetrician and gynecologist said to me, "You spend too much time in the hospital." When asked how he managed his patients, he said, "I rupture the membranes in the morning, attend to my surgical work, and by evening there is usually complete dilatation. The interne and nurses have been taught how to care for my patients during this time and to call me when necessary. With complete dilatation I put on forceps, do an episiotomy, and I am through."

Probably this latter statement was truer than he realized. Such statements are frequently heard and such procedure is often seen. With this attitude toward labor it seems imperative to point out once more the basic teaching that the indications for interference are the conditions of the mother and child, which are expressed in the maternal pulse rate and fetal heart tones, and that management must be more nearly directed by these two factors. One who would attain ideals in obstetrics and at the same time engage in other branches of medical practice, should look upon obstetrics as of first importance. In this connection I would advocate that more power be given to the American Board to

the end that it may direct private hospitals to observe the standards it is advocating for obstetricians and gynecologists.

#### SUMMARY

A study of the cases observed indicates emphatically the conclusions already noted:

First—The necessity of appreciating the relation of good medicine to obstetric problems.

Second—That from the time the patient enters the hospital in labor, is delivered, and returned to her room, the pulse rate should and for the most part, can be maintained at 100, or less.

602 ARGYLE BLDG.

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### ROENTGEN DIFFERENTIATION OF TYPES OF INTESTINAL VAGINAL FISTULA\*

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AN INTESTINAL vaginal fistula is an occasional complication of carcinoma of the female genital tract treated by radiation. Assuming skillful application of radium and x-ray, it arises usually in the cases moderately or far advanced at the time of treatment, and may be due either to postradiation changes or to the advance of the disease. More rarely it follows operative procedures. In all such cases it is important to know the location of the fistula. A fistula may be equally distressing to the patient, no matter where it arises, but the control of the loose stools which are the most disturbing feature, the indications for operation, the nutrition, well-being and perhaps actual survival of the individual, may all depend upon the portion of the bowel communicating with the vagina.

Diarrhea in a pelvic colon fistula may often be controlled by a bland diet and sedatives, but there is no known way successfully to solidify the contents of the small intestine. There is therefore in an ileal vaginal fistula a constant loss of water from the body, and if the fistula is fairly high in the ileum, or the small bowel is irritable and rushes the material through too fast for absorption, there will be a continuous loss of mineral salts and nutrient products of digestion through the fistulous tract. The dietary management of any small intestine fistula is always an exceedingly difficult problem. Where the surgeon therefore is confronted by a difficult or otherwise undesirable operation for closure of a fistula, he is, barring a condition of hopeless malignancy, more or less obliged to attempt to deal with an ileal fistula, while he

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\*Read before the Section on Obstetrics and Gynecology, New York Academy of Medicine, November 24, 1931.

has a wider latitude of choice in a distal colon fistula. A competent gastroenterologist may ameliorate the discomfort of the latter, even to such a degree that the fistula will spontaneously close. The following cases illustrate a simple method of localizing the fistula by barium study of the intestinal tract.



Fig. 1.—Normal colon outline shown by barium enema. No fistula seen.



Fig. 2.—One-half hour after barium meal. Very rapid emptying of stomach and upper small intestine.

CASE 1.—This patient had had two operations for ectopic gestation, in 1919 and 1921, with removal of right and left tube and ovary respectively. She came to the clinic of the Woman's Hospital in May, 1928, with carcinoma of the cervix. She was given 2400 mg. hours of radium at that time. In October, 1928, she was operated upon for intestinal obstruction. Masses of ileum were found, matted together in the pelvis. She had a difficult convalescence, with a long stay in the hospital, during which a ureterovaginal fistula developed, with questionable intestinal vaginal fistula. In February, 1930, she had a nephrectomy for pyonephrosis. After this the intestinal vaginal fistula became more troublesome. The patient lost much



Fig. 3.—Six hours after barium meal. Practically all the barium has run out through the fistula, with none entering the colon.



Fig. 4.—Barium enema given. Very little retained. Fistulous tract shown, communicating with upper pelvic colon.

weight and was very miserable. X-ray studies were made and the fistula localized in the ileum. She was operated upon at her urgent solicitation, though extension of the malignancy was feared. (Cervical carcinoma had apparently healed, following radium two years before.) Metastatic carcinoma in the pelvis, including invasion of ileal coils and the fistulous tract, was found, and the patient died.

The colon is usually examined first, and Fig. 1 shows a normal colon outline. No fistulous tract is seen, and no barium was expelled during the procedure. A second film taken after defecation again showed no evidence of fistula. This postevacuation film is always made, however, as a small fistula may be disclosed under expulsive effort that was not brought out when the barium column was flowing cephalad. The large intestine here being ruled out, a study of the small bowel was made by barium meal. The first film made immediately after barium ingestion showed a normal stomach, but one-half hour later, Fig. 2, it will be seen that the stomach is half empty, representing an extremely rapid outpouring, and most of the material



Fig. 5.—Barium meal. Barium has reached pelvic colon, and fistula, in eight hours, showing marked hypermotility.

has rushed through the duodenum and jejunum into the ileum. A six-hour film, Fig. 3, shows the tract practically empty. All the barium has run out through the fistula, and none has entered the cecum, or passed further into the colon. Thus a diagnosis of ileal fistula is established.

CASE 2.—A young woman, aged twenty-six, entered the Woman's Hospital Cancer Clinic in July, 1926, presenting a carcinoma of the cervix with extension into the left parametrium. She was given 4200 mg. hours of radium. She reentered in November, 1926, with malignant residue on the left posterior lip of the cervix, and extension into the left vaginal fornix, and she was given 3000 mg. hours. She did badly, and in March, 1927, was referred to social service as a hopeless case, and sent to a home for incurables. She reappeared most surprisingly in the clinic some time in 1928, having gained 20 pounds and returned to work. On examination she seemed clinically free from carcinoma, except possibly for a small area in the left broad ligament, which was considered probably due to radium fibrosis, but was marked for careful watching at monthly visits for possible residual malignancy. A suspicion of spread of the process led to high voltage x-ray treatment in 1930, but no further increase has occurred to date. In 1929 a fecal fistula developed.

This was open intermittently at first, but in March, 1931, the patient complained of severe diarrhea and great annoyance from the fistula. At that time there was no evidence of carcinoma recurrence, so with a view to possible closure of the fistula barium studies were made to localize it.

A barium enema was given (Fig. 4) but the colon was so irritable that little barium was retained. The fistula is seen arising from the upper pelvic colon just distal to its junction with the iliac colon. The fistula was therefore located, but in view of the diarrhea, a barium meal was given to study the patient's abnormal hypermotility. Fig. 5 shows a film made eight hours after ingested meal. The barium has reached the pelvic colon, and the fistula, three or four hours ahead of normal average schedule. Following this, however, the barium remained in the



Fig. 6.—Colon outlined by full enema. Fistulous tract concealed behind coils of pelvic colon and rectum.

colon up to seventy-two hours. This last finding offered a valuable hint in treatment. The bland, heavy barium salt acted as a costive, on a patient who had had vigorous purging diarrhea with continuous leakage through the fistula at the time the examination was begun. On an appropriate diet and sedatives, supervised by the gastroenterologist, the diarrhea has ceased, she has slight discharge through the fistula, usually only once a day at time of stool, the opening is smaller, and she has refused operation pending the possibility of complete closure. This patient is clinically free of carcinoma five years after vigorous radiation treatment, although in the earlier stages considered a radium failure.

CASE 3.—A case of adenocarcinoma of the cervix with invasion of both parametria. She had 3600 mg. hours of radium in April, 1931, 225 mg. hours as needles in a small area in August, and a high voltage cycle of x-ray. She developed a fistula.

This case illustrates an important point in technic; namely that it is always desirable to start with a small, rather than the routine large enema. In Fig. 6 the patient had been given, by mistake, a routine enema of an amount sufficient to fill the colon. No fistulous tract can be seen, though barium poured out of the vagina during the entire time of the administration of the enema and the taking of the film. This being discovered, she was returned to the laboratory on a second day, the bowel being first cleansed with nonirritating physiologic saline solution. A second enema, less than a pint, was given, and the fistulous tract disclosed (Fig. 7).

The technic employed in investigating colon fistula is simple. A film is placed under the patient and the machine prepared for instantaneous exposure before the enema is attempted, copious vaginal leakage from a low-down fistula being an annoying handicap which usually increases with every moment the enema is running. A small amount of barium is given, three to six ounces, and a film taken. If insignificant



Fig. 7.—Small enema shows fistulous tract between distal end of sigmoid and vagina.

nificant or no leakage has occurred, 6 ounces more is given, and several films made, in oblique and sagittal views. The whole enema is then given, a single large film made, and finally, and of great importance, another film is exposed after the patient has been allowed to evacuate as much as possible of the clysm. As noted above, small fistulas are sometimes brought out only on expulsive effort.

Where it is necessary to study an ileal fistula by barium meal, the usual roentgenologic procedures are carried out, except that little attention is usually paid to the stomach, and films of the small intestine are made at intervals of one to two hours, until the ileum is empty and the presence or absence of an ileal vaginal fistula proved. The actual fistulous tract between ileum and vagina is much less likely to be visualized than between vagina and pelvic colon, the ileal coils being less fixed in location and less easy to separate and identify in the film image. A fistula is inferred in the small intestine when much or all of the material disappears from the ileum out through the fistula rather than

into the large intestine. Fluoroscopy may often be done to advantage in either case, but we do not practice it routinely because of the annoyance of vaginal leakage. In an obscure case it should invariably be done.

30 EAST FORTIETH STREET.

## BENIGN UTERINE HEMORRHAGE TREATED WITH RADIATION THERAPY, WITH A REVIEW OF 147 CASES\*

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**D**URING the period 1925-1932 there were referred to the Radiation Therapy Service from the Gynecological Division 147 cases of benign uterine bleeding. Only those patients were chosen for this study upon whom careful pelvic examination showed no palpable gross pathology; i.e., malignancy, fibroids, adnexal disease, or ovarian cysts, and where diagnostic curettage eliminated the presence of polyps and submucous fibroids.

The pathologic changes occurring in these cases were situated either in the endometrium, myometrium, or ovaries. Reviewing the pathology in 66 cases of their series, Novak and Martzloff<sup>1</sup> found that, grossly, the endometrium was thickened in the majority of cases, and that microscopically, there was a hyperplasia of the glandular, epithelial, and stromal elements. Large distended glands close to small and narrow ones yielded a picture which they designated "Swiss cheese" pattern. Shaw<sup>2</sup> states that the endometrium may be hyperemic and edematous rather than hyperplastic. Shaw<sup>2</sup> further suggests that the myometrium may be greatly hyperplastic, while Theilhaber<sup>3</sup> states that the uterine musculature may be replaced by connective tissue, and Anspach<sup>4</sup> believes that there is an abnormal distribution of elastic tissue about the blood vessels.

TABLE I. HISTOLOGIC DIAGNOSES OF 70 CASES OF CURETTAGE

AGE GROUP	NORMAL ENDO- METRIUM	ENDO- METRIAL HYPER- PLASIA	ADENO- MATOID HYPER- PLASIA	ATROPHIC ENDO- METRIUM	TUBERCU- LAR ENDO- METRIUM	UN- KNOWN
Young Age						
12-25	2	0	0	0	0	1
Middle Age						
26-40	8	5	6	0	1	2
Menopausal Age						
41-65	9	16	16	2	0	2
Total	19	21	22	2	1	5

\*Read before the Section of Gynecology and Obstetrics, New York Academy of Medicine, January 24, 1933.



The most conclusive work of the ovarian changes is that presented by Schroeder<sup>5</sup> who demonstrated the presence of numerous small follicular cysts which he described as intact unruptured follicles. In addition, he found little or no evidence of corpus luteal formation. He concluded that these persistent unruptured follicles produced a prolonged proliferative stage in the endometrium.

Whatever may be the underlying etiologic factor producing these pathologic changes, we can but agree with Novak, Martzloff and Shaw that there occurs a generalized endocrine disturbance in which the ovaries play a leading part. In our series curettage showed endometrial involvement in most cases.

For the purpose of better study, the 147 cases were divided into three arbitrary groups:

1. *Young Age Group*.—Twelve to twenty-five years, 16 cases. Of these, 3 patients had had a previous diagnostic curettage, and 1, in addition, a suspension of the uterus with no improvement of the bleeding condition. All these patients were treated by high voltage x-ray therapy and in several an additional radium application was given. Table II gives a summary of the amount, the location of the treatment administered, and the results obtained.

An analysis of these results shows that excessive bleeding was controlled in all cases. Normal menstrual cycles were resumed by 11 patients, 2 of whom received irradiation to the pituitary and spleen alone. The remaining 5 patients had an amenorrhea imparted, which, however, because of the brief interval which has elapsed since treatment, cannot be called permanent.

2. *Middle Age Group*.—Twenty-six to forty years, 44 cases. Of these, 17 patients were operated upon, bleeding, however, not being controlled. Table III outlines the therapy administered and the results obtained.

3. *Menopausal Group*.—Forty-one to sixty-five years, 87 cases. In 45 instances curettage was performed, 18 prior to and 27 at the time of radiation treatment. In addition, uterine suspension was done in one case, and operation for cystic ovaries in two cases. In none of these cases, however, was bleeding controlled. Both x-rays and radium were used in 8 cases in this group because there was a suspicion of malignancy although this was not shown in the curettements. Following irradiation, permanent artificial menopause resulted in 83 cases; in the other 4 cases normal menstruation was resumed later (Table IV).

Our results are in accord with the general opinion that radiation therapy is the treatment of choice for benign hemorrhage in patients at the menopausal age. Because of the fear that a permanent sterilization may result from irradiation, there has been a reluctance on the part of gynecologists to subject the younger age group of patients to this form of therapy. But Polak<sup>6</sup> treated 31 young girls with radium and in every instance menstruation later resumed a normal cycle. Simi-

TABLE II. YOUNG AGE GROUP TWELVE TO TWENTY-FIVE YEARS

CASE NO.	AGE	FIRST TREATMENT X-RAYS	RESULTS OF FIRST TREATMENT			SECOND TREATMENT X-RAYS OR RADIUM	RESULT OF SECOND TREATMENT		THIRD TREATMENT RADIUM	FINAL RESULT	
			AMENORR.	CONT'D MENSES	RESUMED MENSES		AMENORR.	RESUMED MENSES		AMENORR.	MENSTRUATION
1	12	Pelvis 75%	*	Mod.*	Reg.*	Pelvis 25%	*	Reg.*			*
2	12	Pelvis 50%		Irreg.*							*
3	13	Spleen 25%	*		Reg.*						*
4	14	Spleen 100%	*		Reg.*						*
5	14	Pelvis 25%	*		Reg.*						*
6	15	Spleen 25%		Profuse*			*	Reg.*			*
7	16	Spleen 50%	*	Irreg.	Reg.*	Radium 1000 mg. hrs.					*
8	17	Pelvis 50%	*		Reg.*						*
9	19	Pelvis 50%		Profuse			*	Profuse*	Radium 600 mg. hrs.	*	For only 3 mo.
10	20	Spleen 25%	*	Irreg.*		Radium 720 mg. hrs.		Irreg.		*	For 16 mo.
11	21	Pelvis 100%	*							*	For 6 mo.
12	21	Pelvis 75%	*							*	For 4 mo.
13	22	Pelvis 25%		Profuse*		Pelvis 100%	*			*	For 36 mo.
14	22	Pituitary 30%		Reg.*		Spleen 25%					*
15	25	Pelvis 100%	*		Reg.*						*
16	25	Pelvis 75%		Profuse*		Radium 1600 mg. hr.	*	Scant*			*
Total 16			10	7	7	5	5	4	1	5	11

\*Positive results, bleeding controlled.

TABLE III. MIDDLE AGE GROUP TWENTY-SIX TO FORTY YEARS

NUMBER OF CASES	FIRST TREATMENT	RESULT OF FIRST TREATMENT			SECOND TREATMENT X-RAYS	RESULT OF SECOND TREATMENT AMENORRHEA	FINAL RESULTS	
		AMENORRHEA	CONTINUED TO MENSTRUATE	RESUMED MENSTRUATION			AMENORRHEA	MENSTRUATION
32	X-rays only Pelvis 100%	30	2 regular	(6) 3 regular 3 irregular	1 Pelvis 100%	1	25	7
6	Radium only 700 mg. hr. 1400 " " 1700 " " 2100 " " 2300 " " 3600 " "	6	0	2 irregular	1 Pelvis 100%	1	5	1
5	X-rays Pelvis 100% Spleen 25%	5	0	2 regular	0	0	3	2
1	X-rays Pelvis 50% Radium 2800 mg. hr.	1	0	0	0	0	1	0
Total 44		42	2	10	2	2	34	10

TABLE IV. MENOPAUSAL AGE GROUP FORTY-ONE TO SIXTY-FIVE YEARS

NUMBER OF CASES	FIRST TREATMENT	RESULTS OF FIRST TREATMENT			SECOND TREATMENT	RESULT OF SECOND TREATMENT	FINAL RESULTS	
		AMENORRHEA	CONTINUED TO MENSTRUATE	RESUMED MENSTRUATION			AMENORRHEA	MENSTRUATION
68	X-rays to pelvis 100%	67	1 profuse	2 regular	1 X-rays to pelvis 50%	1	66	2
10	Radium alone 3500 mg. hr. (average dose)	10	0	0	0	0	10	0
6	X-rays to pelvis 100% Radium 3900 mg. hr. (average dose)	6	0	1 scant	0	0	5	1
1	X-rays to pelvis 100% spleen 25%	0	1 profuse	0	Radium 2500 mg. hr.	1	1	0
2	X-rays to pelvis 100% spleen 25% Radium 1100 mg. hr.	1	1 regular	0	0	0	1	1
Total 87		84	3	3	2	- 2	83	4

TABLE V. PROBABILITY CHART

AGE GROUP	NO. CASES	AVERAGE TIME OF RESUMPTION	CONTINUED TO MENSTRUATE OR RESUMED MENSTRUATION	CASES OF AMENORRHEA FOLLOWED OVER AVERAGE TIME OF RESUMPTION	TOTAL CASES FOLLOWED OVER AVERAGE TIME OF RESUMPTION	PERCENTAGE PROBABILITY OF MENSES FOLLOWING THERAPY	CASES OF AMENORRHEA FOLLOWED BELOW AVERAGE TIME OF RESUMPTION
12-18	8	5.3 months	8	0	8	100%	0
19-25	8	14.5 months	4	1	5	80%	3
26-32	13	6.8 months	6	2	8	75%	5
33-39	25	9.7 months	7	6	13	53.8%	12
40-46	57	9 months	4	35	39	10.3%	18
47-53	32	8 months	2	22	24	8.3%	8
54-60	2	0	0	2	2	0%	0
61-67	2	0	0	22	2	0%	0
Totals	147				101		46

larly, a 100 per cent resumption is cited by Norsworthy<sup>7</sup> whose 13 cases of adolescent hemorrhage were treated with radium. Less striking results, but nevertheless sufficiently encouraging, are reported by Neil<sup>8</sup> who had 24 patients resume normal menses, in a series of 30 cases. Even beyond the arbitrary adolescent group, Stacy<sup>9</sup> reported only 6 cases of permanent amenorrhea out of 122 patients below the age of thirty-five. It is evident, therefore, that this fear of permanent amenorrhea is quite unwarranted.

In order to determine the relative percentage of the likelihood of either continuing or resuming menstruation after a first series of radiation therapy, we have arbitrarily divided the 147 cases on our charts into eight smaller groups covering a six-year time interval. From our study of these cases we have deduced the data making up Table V, showing the probable duration of amenorrhea in all but 46 of the patients, who were too recently treated.

#### CONCLUSIONS

1. Radiation therapy was successful in controlling all cases of uterine hemorrhage.

2. In a number of the cases, curettings were histologically normal, which leads us to believe that some endocrine disturbance was at the root of the bleeding.

3. Some patients resumed menstruation while others of the same age and receiving the same type of therapy became permanently amenorrheic.

4. In the young age group, a second irradiation treatment is required more frequently than in the older groups to control bleeding.

5. There is a progressive decline in the chances for resumption of menstruation from the younger to the older group.

#### REFERENCES

- (1) *Novak and Martsloff*: AM. J. OBST. & GYNEC. 8: 385, 1924. (2) *Shaw quoted by Martin*: Am. J. Roentgenol. 25: 349, 1931. (3) *Theilhaber quoted by Novak, E.*: N. Y. State J. M. 25: 961, 1925. (4) *Anspach quoted by Novak, E.*: vid. No. 3. (5) *Schroeder quoted by Novak and Martsloff*: vid. No. 1. (6) *Polak, John O.*: Am. J. Surg. 6: 652, 1929. (7) *Norsworthy, O. L.*: Am. J. Roentgenol. 21: 336, 1929. (8) *Neil, Wm.*: Am. J. Roentgenol. 17: 461, 1927. (9) *Stacy, Leda J.*: Am. J. Roentgenol. 7: 379, 1920.

# WEIGHT CHANGES IN THE LAST FOUR MONTHS OF PREGNANCY\*

## A STUDY BASED UPON 663 CASES OF NORMAL PREGNANCY AND PREGNANCY COMPLICATED BY TOXEMIA

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ALTHOUGH the literature contains many studies of the weight change in pregnancy, especially regarding its relationship to the late toxemias, there is little data which can be applied in actual practice. The clinical value of most of the conclusions drawn from these studies is obviously uncertain due to the paucity of material, or the fewness and irregularity of observations, or the circumstances under which the weights were taken.

In order to obtain further and more practical data on weight changes in the last four months of pregnancy, and the causes of variations, we have selected and studied 663 suitable case records of private patients who were attended by us at several Detroit hospitals during the last eight years. The records of the 624 normal patients were studied first. These patients were all of the white race, in the vast majority native born, with no economic necessity for restriction in diet, and were delivered within two weeks of the expected date, calculated from the last menstrual period. We did not consider slight or moderate edema of the extremities an abnormality in itself, since it is so nearly universally present in the latter months of pregnancy.

The normal series was further restricted to patients who were weighed at the twenty-fourth, twenty-eighth, thirty-second, thirty-fourth, thirty-sixth, and thirty-eighth weeks. From these weights were calculated the weight changes for the seventh and eighth lunar months of pregnancy and for each two weeks' interval thereafter until the thirty-eighth week. Only 460 were weighed early in labor or within a few days of its onset so as to determine the change in the last two weeks. In Table I are shown the average gains in pounds for the various periods and the average total for the last four months of pregnancy.

Further examination of the material quickly showed that these figures were of little or no significance, since deviations from the averages were many and extreme. Table II shows the distribution of

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TABLE I. AVERAGE NORMAL WEIGHT GAIN

WEEK	24-28	28-32	32-34	34-36	36-38	38-40	TOTAL
Pounds gained	4.4	3.9	2.0	2.1	2.0	1.3	15.7

gains and losses for the different periods, and Table III gives the variations in the total gains of those weighed throughout the last four months.

TABLE II. DISTRIBUTION OF WEIGHT CHANGES BY PERIODS

WEEKS:	24-28	28-32	32-34	34-36	36-38	38-40
Lost weight	11	15	33	43	62	110
Gained weight						
0-1 pounds	15	41	79	82	88	74
1-2 pounds	40	54	151	142	132	76
2-3 pounds	72	83	175	149	157	75
3-4 pounds	97	85	111	114	76	44
4-5 pounds	116	133	52	57	63	40
5-6 pounds	105	72	16	19	20	21
6-7 pounds	71	77	5	12	16	11
7-8 pounds	39	29	0	7	6	3
8-9 pounds	29	24	1	0	2	4
9-10 plus	29	11	1	0	2	2

TABLE III. DISTRIBUTION OF TOTAL WEIGHTS

NO. PATIENTS		NO. PATIENTS	
Lost weight	2	16-20 pounds	121
Gained weight		20-24 pounds	70
0-4 pounds	8	24-28 pounds	30
4-8 pounds	27	28-32 pounds	6
8-12 pounds	77	32-36 pounds	3
12-16 pounds	113	36 plus pounds	3

In an attempt to explain these differences, several possible factors were considered. Parity, age, and body build, or ratio of weight to height, have been considered as modifying influences by most writers. Parity was studied first, and in Table IV are given the average gains for women in the first and second pregnancies and for those in the third and succeeding pregnancies.

TABLE IV. AVERAGE PERIODIC WEIGHT CHANGES ACCORDING TO PARITY

WEEKS	PARA I	PARA II	PARA III PLUS
24-48	4.5	4.5	4.1
28-32	4.1	3.8	3.4
32-34	2.0	2.1	1.7
34-36	2.2	2.0	1.8
36-38	2.1	1.8	1.8
38-40	1.2	1.5	1.5
Total	16.1	15.7	14.3



Apparently, the greatest average gain occurs in the first pregnancy. Each succeeding pregnancy shows a slightly smaller gain. These relatively slight differences, however, in no way explain the wide variations shown in Tables II and III. In fact, a table, which is not shown here, made out for the different parity groups showed as much variation from the averages as did Tables II and III for the entire series.

To investigate the influence of age upon weight changes, three groups were studied as follows: (1) Those less than twenty-five years of age. (2) Those who were twenty-five and less than thirty-five years of age. (3) Those who were thirty-five years of age or older. The average gains for the three groups were, respectively, 17.9, 15.8, and 12.3 pounds during the last four months of pregnancy.

It was at once evident that age might also be the factor responsible for the differences associated with parity since primiparas, for instance, would naturally tend to be younger than those who had already had several pregnancies. The actual percentage incidence of young, medium-aged, and elderly women for the primiparas was 31, 61, 8; for secundiparas 11, 71.5, 17.5; and for tertiparas and above was 0, 72, 28. Table V shows the average in the different periods for these parity groups, subdivided according to age. Parity alone, evidently, has little influence, while age is an important factor.

TABLE V. AVERAGE PERIODIC WEIGHT ACCORDING TO PARITY AND AGE

WEEKS	24-28	28-32	32-34	34-36	36-38	38-40	TOTAL
<i>Age</i>							
<i>Para i:</i>							
--- 25 yr.	5.1	4.6	2.2	2.4	2.3	1.1	17.7
25 to 35	4.3	3.9	2.0	2.3	2.2	1.3	16.0
35 ---	3.3	3.2	2.3	1.3	1.2	1.0	12.3
<i>Para ii:</i>							
--- 25 yr.	5.6	4.3	1.9	1.9	2.1	3.3	19.1
25 to 35	4.5	4.0	2.0	2.1	1.7	1.2	15.5
35 ---	3.4	3.3	2.4	1.7	2.1	0.9	13.8
<i>Para iii:</i>							
--- 25 yr.	--	--	--	--	--	--	--
25 to 35	4.7	3.6	1.8	1.8	1.8	1.9	15.6
35 ---	2.7	2.7	1.5	1.6	1.6	0.8	10.9
<i>Whole Group</i>							
--- 25 yr.	5.2	4.5	2.1	2.3	2.3	1.4	17.8
25 to 35	4.4	3.9	1.9	2.1	1.9	1.4	15.7
35 ---	3.1	3.1	2.0	1.5	1.6	0.9	12.2

For the consideration of body build, or the relationship of weight to height, on weight changes during pregnancy, there were 351 cases with suitable observations for study. These patients were divided into three groups: (1) slender, up to two pounds per inch of height; (2) medium, from two to two and one-half pounds; and (3) stout, two and one-half pounds or more per inch. The total gains for

the three groups were 16.2, 15.8, and 15 pounds, thus indicating a slight tendency for increase in total gains during the last four months for the more slender women.

These height-weight ratio groups were subdivided according to the age groups mentioned above, and the average total gains for each of the periods of pregnancy are shown in Table VI. Here it is noted that the young women and those of medium age show little difference, other than that explained by age; while the older women seem to gain definitely less when stout, though we feel that this should not be emphasized because the data are obtained from an analysis of a relatively small group of cases (45).

TABLE VI

WEEKS	24-28	28-32	32-34	34-36	36-38	38-40	TOTAL
<i>Young (71):</i>							
Slender	5.9	4.5	2.1	2.4	2.7	0.9	18.5
Medium	5.6	4.5	2.2	2.2	1.9	1.9	18.1
Stout	5.9	5.1	2.0	1.8	3.1	0.3	18.2
<i>Medium Age (235):</i>							
Slender	4.7	3.7	2.1	2.3	1.8	1.2	15.8
Medium	4.6	3.8	2.0	1.8	2.1	1.4	15.7
Stout	4.4	3.0	1.9	2.4	2.2	1.3	15.2
<i>Elderly (45):</i>							
Slender	4.2	4.6	2.3	1.2	1.1	1.9	15.3
Medium	2.8	3.3	2.7	1.5	1.4	0.7	12.4
Stout	1.8	3.0	2.1	1.1	2.1	1.4	11.5

## DISCUSSION

The foregoing tables appear to show that age is of considerable importance as a factor in weight changes during the last four months of pregnancy, while parity and body build are of slight or questionable influence. Any attempt, therefore, to establish normals for weight gain during pregnancy should take into consideration the age of the patient.

While age appears to be the most important factor, it must be borne in mind that these are *averages* computed from figures showing wide variations in weight changes within the groups, ranging from actual weight loss to twice the average gain. Such averages, therefore, are of value as indicating a group tendency rather than the normal expectancy of the individual of a certain age. It should be stated here that in instances where there was a marked tendency toward one extreme or the other, effort was made at correction by changes in caloric intake. Otherwise, even greater and more frequent variations might have occurred.

Zangemeister's observation that weight loss occurs prior to the onset of labor is confirmed to some extent in our series. This was observed during the last two weeks of pregnancy in 110 of a series of 460 patients (23.9 per cent).

## TOXEMIAS

For the investigation of the weight changes in toxemias of pregnancy, there were available for study 39 cases. Questionable toxemia was excluded by considering only those cases which showed hypertension of at least 140 mm. mercury systolic and definite albuminuria. The majority of these patients showed varying degrees of edema, although this sign alone, regardless of degree, was not considered pathognomonic of toxemia in the absence of hypertension and albuminuria.

There is a general clinical impression supported by statements in the literature that late toxemias are usually associated with excessive gain in weight due to edema. In this series the total average gain was 20.9 pounds as compared with 15.7 pounds for the normals, this increase in the cases with toxemia being due to a high case frequency of excessive gain at one or more observation periods. For practical purposes we considered an excessive gain to be twice the normal average, according to age (whole group, Table V). Using this criterion it was found that 28, or 72 per cent, of the toxemic patients gained excessively at one or more periods. Those who showed no excessive gain were all of the preeclamptic type, and usually the toxemias of mild or moderate severity.

Investigation regarding the time of occurrence of this excessive gain in relationship to the onset of toxemia showed that it was first noted one or more periods before the first definite sign of toxemia (usually hypertension) in 17 or 43.7 per cent of the cases; coincided with the appearance of the first sign of toxemia in 6 or 15.5 per cent; and was noted only after the onset of toxemia in 5 or 12.8 per cent. As stated before, 11 or 28 per cent of the cases showed no excessive gain. There were four cases of eclampsia. Each one of these patients gained excessively at one or more periods during the last four months; in two cases the excessive gain preceded and in two cases the gain coincided with the appearance of the first sign of toxemia.

The foregoing suggested that regular weighing might be of value in anticipating a considerable portion of toxemia cases, since in more than two-fifths (17) there was an excessive gain preceding definite signs of the disease. Contrary to our expectation, this was found not to be the case, for in the complete series there was the large group of 280 with a similar gain of at least twice the average in one or more periods who completed pregnancy without any sign of toxemia. Combining the figures we have a group of 297 available for the prediction, if possible, of toxemia on the basis of excessive weight gain. Actually, only one in seventeen developed toxemia, essentially the same incidence as for the whole series of 663 patients.

## SUMMARY

Weight changes calculated from periodic observations during the last four months of pregnancy showed many and extreme variations from the average. Parity and body build (height-weight ratio) had little or questionable influence in causing these variations. Age had some effect (younger women gaining more than older) regardless of parity and body build, but failed to explain most of the deviations from the average.

Excessive gain at some period or periods was noted in the majority of patients with late toxemia of pregnancy. It occurred before the onset of definite signs in two-fifths of the toxemia cases but was also found to occur with the same frequency in normal pregnancy. Therefore, in this relatively small series, excessive weight gain appeared to be of questionable clinical value in the early recognition of impending toxemia.

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ACUTE INVERSION OF THE UTERUS, WITH A REPORT OF FOUR CASES\*

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ACUTE inversion of the uterus has been noted in the Methodist Hospital only four times since the beginning of the Department of Obstetrics in 1906, during which time there have been 26,000 deliveries, giving an incidence of one inversion to each 6,500 cases.

For convenience of description we have divided these four cases of acute inversion of the uterus into two groups: (1) The sudden or expulsive inversion, two cases, and (2) the acute delayed or gradual inversion, also two cases.

As representative of the first group we have Mrs. K., para ii, white, aged twenty, due Dec. 10, 1926, with a history of a seven months' baby after a short normal labor, one year previously. She first visited the antepartum clinic in the sixth month of the present pregnancy. Her initial examination showed poor general condition and bad teeth. At her second visit three weeks later she had a blood pressure of 140/90, and a heavy trace of albumin. She was placed on anti-toxic régime. In the eighth month her blood pressure remained high with marked albuminuria. Hospitalization was advised but refused. This patient was admitted to the hospital, very toxic, ten days before term on Nov. 30, 1926. On the same day a 6 pound 6 ounce child was delivered spontaneously after one hour and fifteen minutes of labor. Following the second stage, five minims of pituitrin were given, the placenta was expressed with difficulty after thirty-three minutes; one ampule of gynergen was given at once which did not control bleeding; hence, five minutes later one ampule of pituitrin was given. This was followed by strong contractions

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of the uterus. The patient was returned to the ward in fair condition, but it was soon noticed that she was in shock and was bleeding rather profusely. An attendant who was in the hospital, immediately examined her and made a diagnosis of inversion of the uterus, and under light anesthesia the uterus was reinverted without difficulty. The uterine cavity was packed with gauze, saline infusion given, but the patient died from the extreme shock before a transfusion could be accomplished.

CASE 2.—Group 1, a para ii, white, aged twenty-eight, whose first child was born two years previously without difficulty, was admitted to the hospital at term. A 9 pound child was delivered with prophylactic forceps, after two hours and twenty-four minutes of labor. One ampule of pituitrin was given immediately and the placenta expressed without difficulty eight minutes after birth of the child. This was followed by one ampule of pituitrin and the patient returned to bed with the fundus well contracted and no bleeding. At end of one hour, because of a relaxed fundus, one ampule each of pituitrin and aseptic ergot was given. One-half hour later the patient was actively bleeding; the pituitrin and ergot were repeated, after which the bleeding became profuse and the patient was shocked. The vagina was packed, infusion of saline was given and a donor for transfusion was obtained, but the patient died before the transfusion could be effected. The diagnosis of acute inversion was made while packing the vagina for control of the bleeding.

As representative of Group 2, the gradual or delayed type of inversion, we have Case 3, a para i, aged twenty, white, admitted to the hospital at term. A five pound child was delivered spontaneously one hour and fifty-eight minutes after the onset of labor. One-half ampule of pituitrin was given immediately and the placenta expressed sixteen minutes later without difficulty. Following this, injections of one ampule each of pituitrin and aseptic ergot were given. This medication was repeated twice at hourly intervals because of a soft fundus and moderate bleeding. Following the last dose, the patient bled profusely and her condition became alarming. The vagina was packed, a hypodermoclysis given, followed later by a transfusion with marked improvement in her condition. On the eighth day, because of a low grade temperature and profuse sanguinous lochia, a vaginal examination was done and a complete inversion of the uterus discovered. Transfusion was repeated and manual reduction of the uterus under deep ether anesthesia, was performed with considerable difficulty. After replacement, the uterine cavity was packed with gauze. This was removed after forty-eight hours and a rapid recovery followed. This patient has had no subsequent pregnancy.

CASE 4 of this second group is Mrs. B., a para i, white, aged twenty-eight, admitted to the hospital at term, having a moderate funnel pelvis. After eleven hours of labor, a seven and one-half pound child was delivered with low forceps. Five minims of pituitrin were given immediately and five minutes later the placenta was easily expressed. One ampule each of gynergen and pituitrin was given at the completion of the third stage. One hour later a relaxed uterus with abnormal bleeding was reported, the pituitrin was repeated. On the tenth day because of a low grade temperature, inability to void and a profuse lochia, a vaginal examination was done and a complete inversion of the uterus found. Under deep ether anesthesia the inversion was readily reduced by manual manipulation. Following this, the uterus was packed with gauze. The packing was removed in forty-eight hours. This patient had an uneventful convalescence. It is interesting to note that one year later this patient aborted in the fifth month and had a severe postabortal sepsis.

Many theories have been advanced regarding the etiology and mechanism of acute inversion. McCullough has shown it to occur about equally in multiparous and primiparous women. It is a generally accepted fact that in order for an acute inversion to occur we must have a relaxed or unequally contracted uterus. These prerequisites may be found in varying degrees in most postpartum uteri, from several causes, the most important of which we believe to be an isolated area of muscular relaxation or unusual relaxation of the lower segment from poor muscle tone.

If the uterus is carefully palpated immediately postpartum, an area which is soft and indentates easily can often be located. This softness may be due to physiologic inertia of the placental site, muscular incoordination, or disturbance in the conductive mechanism of the uterus, but regardless of the etiology it is subject to action from the contiguous well contracted muscle. Unusual relaxation of the lower uterine segment from poor muscular tone we believe to be present in most of the women who deliver their babies very rapidly, particularly the multiparous woman. Both of our multiparous cases were of the expulsive type of inversion. Their average duration of labor to complete dilatation was less than two hours.

The fact that some uteri will invert themselves through any opening that will permit has been impressed on us recently by two cases. On opening the abdomen of a case of ruptured uterus through an old cesarean scar, we found the fetus and placenta free in the abdominal cavity and the uterus completely inverted through the old line of incision. In another cesarean section, there was some delay in closing the uterine wound. During this delay the fundus became soft, hence one ampule of pituitrin was injected directly into the uterine muscle. In an incredibly short time there occurred a complete inversion through the line of incision in the uterus.

The factors necessary for the production of an inversion are present without importance in the majority of instances, but may serve as predisposing causes, in the presence of extraneous forces such as fundal pressure, funic traction, or following the administration of oxytocic agents, especially pituitrin. Judging from the number of cases appearing in the literature, the incidence of acute inversion of the uterus has apparently increased, since the introduction of this hormone into the practice of obstetrics about 1909. We feel that any rapidly acting oxytocic agent of which pituitrin is the most striking example, may play an important part in acute inversions of the uterus. With this thought in mind, we would like to remind you of a few well-known clinical facts concerning the action of this drug, viz., that the response to pituitrin varies with the susceptibility of the individual patient, a small dose producing little effect in one uterus and

tetanic contractions in another. Furthermore, the reaction is more marked in those cases where the musculature has not been fatigued by long labor, and in all cases the action is greatest in the thick fundal portion of the uterus, the thin lower segment having less muscle tissue does not therefore react so readily to pituitrin. Clark has shown experimentally that the uterine contractions originate somewhere near the cornu and travel from above downward. This may be demonstrated at any cesarean section for when pituitrin is injected directly into the uterine muscle, the blanching, which denotes the onset of the contraction, is most marked in the fundus and proceeds downward. Thus we see how easily an inversion could occur with an overstimulated fundus and a relaxed lower segment.

We have noted that each of our four patients was given pituitrin immediately following the birth of the child. Pituitrin given at this time unquestionably causes more rapid separation and expulsion of the placenta, and there is no objection whatever to its use for this purpose, if we remember that it may render the muscle more susceptible to subsequent or repeated large postpartum dosages.

In our two cases of the expulsive type we consider that the individual susceptibility of the patient to pituitrin was so great that the vigorous action of the stimulated muscular fundus caused herniation of the upper portion through the relaxed lower segment, which had not had sufficient time to recover even a part of its normal tone. In Case 1, considerable fundal pressure was made in order to expel the placenta. This possibly indented the fundus to a considerable extent, which indentation became an inversion when the uterus was stimulated with pituitrin. We feel that the sudden type of inversion is more apt to occur in the multiparous woman because of her more relaxed lower segment.

In the two cases of the gradual type both of which were primiparous, we think that the frequently repeated injections of pituitrin at such short intervals, together with inexperienced handling of the fundus, may have produced a violently contracting muscle which gradually invaginated its relatively relaxed area, perhaps the placental site, through the less resistant lower segment to the extent of a complete inversion. We would expect the gradual inversion to occur more frequently in primiparous women as they are more likely to have the placenta situated in the fundus. It is our routine practice at the Methodist Hospital to regularly palpate but not massage the fundus during the third stage of labor, and all fundi are held by a nurse one hour following the completion of the third stage.

While the theoretical factors concerned in causing this condition are most interesting, there are a few practical points that are impressive. For example, the predominating symptoms, shock and hem-

orrhage, were present in three of the four cases, the severity varying in proportion to the suddenness with which the inversion took place and the amount of bleeding. In the expulsive group the shock and hemorrhage were of sufficient severity to cause death, while the delayed group showed little shock because of the more gradual occurrence of the inversion. The subjective symptoms following the acute stage in the two patients that survived, were a septic temperature with profuse lochia and bladder or rectal disturbance. None of our patients had pain after the inversion occurred. Failure to bear in mind the possibility of inversion of the uterus causes delay in making the diagnosis. Any postpartum case that shows undue shock in proportion to the blood loss, or continues to bleed postpartum should be examined with this condition in mind. The diagnosis is made by finding a pedunculated tumor in the vagina. The question as to the nature of the tumor is settled in thin women by abdominal palpation, which reveals the fundus absent with the characteristic cup-shaped mass occupying its position. In stout women abdominal palpation is often unsatisfactory; in such cases rectal examination will reveal a complete absence of the uterus above the vaginal mass. Jones has called particular attention to the tubal openings as a diagnostic point, but we were unable to demonstrate this finding in our cases, because of the edema and bleeding which is generally present in the acute case.

Interference with the normal mechanism of the third stage of labor we feel to be the cause of most of the complications encountered after delivery and particularly of acute inversion. After expulsion of the placenta and administration of pituitrin, the fundus should be held high in the abdomen, applying suprapubic pressure as described by Dickinson until the muscle is equally contracted and the lower segment has sufficient time to recover its tone.

As our knowledge of the causation and management of acute inversion of the uterus has increased, the mortality rate has been materially lowered. In 1910 a series of cases were reported with the remarkably high mortality rate of 70 per cent, while Findley in 1929 states that the rate should not exceed 3 per cent. The reduction of this rate has been accomplished by more astute diagnostic acumen, transfusion, strict asepsis and waiting for reaction from shock before replacing the uterus. Watson has pointed out that the infrequent occurrence of acute inversion has prevented a large experience by any one obstetrician and this fact may account for the tardy recognition of the danger in replacing an acute inversion in the presence of shock. Hoover in a collected series reported that in 79 cases of replacement performed in the presence of shock, the mortality was 30 per cent, while in 47 cases of the same type where the operation was postponed until the patient had reacted from shock, the mortality was 5 per cent.



In our group, Case 1 was possibly lost because of her poor general condition due to toxemia. We now believe that it would have been wiser to wait for a transfusion and improvement of the shock before replacing the uterus. The other mortality was probably due to delay in the institution of appropriate treatment. Earlier diagnosis and more prompt treatment perhaps would have saved her life.

If a diagnosis of acute inversion is made before the intervention of shock, the inversion may be replaced immediately. In the presence of severe shock, however, the vagina is best packed, the patient transfused and no other manipulation attempted until the shock has been overcome.

Huntington and Kellogg have up to the present time replaced seven cases of inversion of the uterus by the abdominal route without difficulty, but judging from the ease of replacement in our small number of cases, we feel that practically all acute inversions can be manually reduced through the vagina. Considerable patience, good anesthesia, and plenty of time are required for this method. Gaudino's success in replacing an inversion under spinal anesthesia after other methods had failed is worthy of note.

From this study the following conclusions seem justified:

1. That susceptibility to the action of oxytocic drugs in uteri with unequally contracted muscle or relaxed lower segment may be the direct factor in the production of an inversion.
2. That repeated doses of oxytocic drugs postpartum may complete a partial inversion which has been started by the inexperienced manipulation of the fundus.
3. That transfusion is the most efficient measure in combating the shock and hemorrhage that invariably accompanies acute inversion.
4. That replacement of the inversion should not be attempted until the patient has thoroughly reacted from the effect of shock and hemorrhage.
5. That most acute inversions of the uterus can be replaced by vaginal manipulation, and we feel that packing of the repositioned uterus is a factor in preventing reinversion.
6. That the possibility of acute inversion should be borne in mind in cases of severe or prolonged postpartum bleeding.

## URINARY SUPPRESSION AND UREMIA FOLLOWING TRANSFUSION OF BLOOD

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THE fact that there are certain dangers attending any transference of blood from a normal to an ill person has been known for the last two centuries. Most of the reactions following such a procedure remained unexplained and their etiology seemed a mystery until the establishment of definite blood groups with a method of determining each by Jansky in 1907 and by Moss in 1910. As a result of these classifications, simple methods of grouping and of cross-agglutination have been demonstrated which have served to eliminate as blood donors many persons whose blood was shown in the laboratory to cause hemagglutination with the blood of the recipient, i.e., the two bloods were incompatible.

That there are perhaps other factors as yet little understood but which may nevertheless play a significant part in the causation of reactions following transfusion, was recently emphasized by Bordley<sup>1</sup> in a review of 17 cases. Since that time we have had the opportunity of studying on the Gynecological Service of the Boston City Hospital, 3 unusual cases in which a reaction occurred subsequent to the transfusion of blood. These 3 case reports are offered to supplement the literature now available dealing with these not infrequent phenomena, and to stress further their importance. It is regrettable that in only one of the two deaths was it possible to obtain permission for a postmortem examination.

CASE 1.—H. G., aged thirty-three years, married, white, was admitted on April 13, 1931. She had had a previous cholecystectomy and appendectomy and had undergone six full-term normal deliveries. She was about three and a half months pregnant but began to flow and pass clots two weeks ago and two days before admission she passed the fetus. Flowing began again the night before admission. Physical examination showed a well-nourished white woman in partial shock and showing profound evidence of loss of blood. Her blood pressure was 84/30, pulse 130, respirations 30, and temperature 98° F. The heart and lungs were essentially negative. Pelvic examination showed the uterus enlarged to approximately the size of a three and a half months' pregnancy, in anterior position and freely movable. The external os was wide open and placental tissue protruded.

A diagnosis of incomplete miscarriage was made and curettage followed by blood transfusion was ordered. Without anesthesia, under the usual aseptic technic the uterus was curetted of a large amount of necrotic, slightly foul smelling, placental tissue. The cervical canal was then iodinated and washed with alcohol, following which flowing had ceased.

The condition of the patient immediately following the operation was unchanged except that the pulse had risen to 150. Her husband was found to be a compatible

donor and so she was given 420 c.c. of whole blood on the operating table by the direct transfusion method of Scannell. The blood compatibility was ascertained by grouping the husband's cells with the patient's serum. Twenty minutes later she had a moderately severe reaction manifested by chills, slight cyanosis, dyspnea, lumbar backache, and nausea. The pulse remained 150 but the quality did not seem quite so good, though still strong. Her temperature remained unchanged at slightly subnormal. She was given morphia, gr.  $\frac{1}{4}$ , and adrenalin, m. 10, which quieted her in about fifteen minutes. At the end of an hour she was much improved and her pulse, still 150, was a great deal stronger.

On the day following the operation the patient had not voided, so she was catheterized and 12 ounces of urine were obtained. At forty-eight hours after the transfusion she still had not voided spontaneously, so she was again catheterized and 14 ounces of cloudy, amber-colored urine were obtained which showed a trace of albumin and many white blood cells. Later, seventeen hours after the last urine specimen and sixty-five hours after the transfusion, about 2 ounces of very dark, concentrated urine was obtained by catheterization. This showed a heavy trace of albumin and small amounts of sugar, and the sediment was loaded with pus cells. The patient was given large amounts of fluid by mouth and saline and glucose by hypodermoclysis. Hot water bottles and extra blankets were applied and the administration of hexamethylenamine and sodium acid phosphate three times daily was begun. On the fourth day she began to void spontaneously but passed only very small quantities of urine which were always highly concentrated, contained large amounts of albumin, and showed many pus cells in the sediment. She was drowsy, lethargic, and disoriented for time and place. On the morning of the eleventh day, the patient had a moderately severe convulsion which lasted about fifteen minutes. The nonprotein nitrogen content of the blood was found to be 92 mg. per 100 c.c. The blood pressure was 106/60 at this time and the urine still showed much albumin and many pus cells.

Following the convulsion the patient improved gradually and on the thirteenth day the blood picture was R.B.C. 3,250,000, hg. 50 per cent, W.B.C. 6,200. On the twentieth day the nonprotein nitrogen content of the blood was 58 mg. and the patient looked very much better, though still a trifle pale and anemic. Her kidney function as determined by the phthalein test was only 20 per cent for the first hour and 15 per cent for the second hour. She was discharged on the twenty-second day fully recovered from the effects of her miscarriage, and the uterus was well involuted. She was voiding abundantly and the urine showed only the slightest possible trace of albumin with a very few white blood cells in the sediment. Blood taken for a repeat cross-agglutination with the donor's blood showed incompatibility at this time.

CASE 2.—M. M., aged thirty-two years, single, white, was admitted to the Gynecological Service on May 18, 1931, but on account of an extreme secondary anemia due to vaginal bleeding, attempts were made to improve her blood picture before any surgical measures were attempted. A diagnosis was made of fibroid uterus, large cervical polyp, and severe secondary anemia.

On June 9, following a second transfusion of 500 c.c., using the citrate method, the patient began to bleed severely, losing practically as much blood as had been given by transfusion. On June 10, a moderate sized submucous myoma was removed, followed by a uterine pack to control bleeding. A third transfusion of 500 c.c. by the citrate method was done. The next day the patient's condition was slightly improved, her pulse ranging from 90 to 100. She was given large quantities of fluid by mouth and by hypodermoclysis and also a fourth transfusion of 500 c.c., this time of whole blood, by the Scannell method.

On June 12, a supravaginal hysterectomy was done under spinal anesthesia, using 165 mg. of novocaine in 3 c.c. of spinal fluid. Immediately following the operation, and while the patient was still on the operating table, she was given 500 c.c. of whole blood by the direct method, this being her fifth transfusion. There was no immediate reaction.

On the second day postoperative, there was no vomiting or distention, she was taking fluids well by mouth, and was being given glucose and saline by hypodermoclysis. The pulse was of excellent quality. Temperature 100.4°, pulse 124, respirations 24. By the fourth day there was practically a complete anuria. She was catheterized and only two ounces of urine were obtained which represented the total amount of urine secreted for thirty-six hours. Analysis showed a heavy trace of albumin and virtually nothing but pus cells in the sediment. The nonprotein nitrogen content of the blood was 200 mg. per 100 c.c. and the R.B.C. count was 4,100,000, with hemoglobin of 60 per cent. The legs were markedly edematous and the patient was almost comatose. The pupils were contracted, the tongue was furred, the breath was heavy, and there were fine twitchings of the muscles, a textbook picture of uremia. Temperature 100.4°, pulse 124, respirations 24. Intravenous saline and glucose were given but to no avail. In spite of every form of stimulant the patient grew gradually worse and died on the sixth day after operation.

The final diagnosis was fibroid uterus, secondary anemia, and uremia. Unfortunately, it was impossible to obtain permission for a postmortem examination. The blood of each transfusion donor had been grouped and cross-agglutinated by the Thorndike Blood Service, and all donors used were found to be compatible with the blood of the recipient and of the same blood group. Furthermore, two days after her last transfusion, a sample of blood was taken from the patient and again found to be compatible with each and every donor used, thereby practically precluding any hemagglutination as being responsible for the loss of kidney activity with ensuing uremia.

CASE 3.—J. A., aged twenty-two years, married, white. Her father died at the age of twenty-three years from acute nephritis and one sister, aged eighteen years, is a severe nephritic under treatment at the present time. The patient has had three full-term normal deliveries and had what she terms "urinary troubles" following the last pregnancy. She was about three months pregnant when she began to have profuse vaginal bleeding with the passage of clots one week prior to admission. Physical examinations showed a well-developed, rather obese, young female in shock, flowing freely. Her skin was cold and clammy, pulse 150 and at times imperceptible. The heart and lungs were negative. Pelvic examination showed the uterus enlarged to the size of a three or four months' pregnancy with the cervical os wide open and placental tissue protruding. There was a moderate hemorrhage from the uterine cavity.

The diagnosis of incomplete miscarriage was made and the following treatment decided upon. An immediate dilatation and curettage was done under very light anesthesia and a moderate amount of placental tissue was obtained. With massage of the fundus uteri bimanually and with administration of pituitrin intramuscularly the hemorrhage was readily controlled. The patient was in fair condition following the operation. She was now given 500 c.c. of citrated blood by the indirect method, one-half hour being the time consumed in infusing the blood. The blood cells of the donor were compatible in cross-agglutination with the blood serum of the recipient. This compatibility was later confirmed by another cross-agglutination test. Neither patient nor donor was typed, however. One-half hour after the transfusion she had a severe chill lasting fifteen minutes. The pulse became rapid and weak, requiring stimulation, following which she improved noticeably so that two hours later her condition was fairly good.

The first two days of convalescence were uneventful; the pulse remained about 100 and the temperature was normal. She voided a normal amount of urine, the analysis of which was negative except for a few white blood cells. Her color was still very pallid but there was no evidence of any jaundice. On the third day the patient began to vomit and complained of severe headache and pain in the right upper quadrant, and the liver edge could be palpated below the costal margin. Her blood pressure was 100/60. Mentally she was quite sluggish and very drowsy. There was no visual disturbance. On the fourth day she passed only two ounces of urine and then did not void again for forty-eight hours, following which she passed two ounces of very concentrated urine containing a large amount of albumin and many red blood cells but no casts.

For the next seven days the patient had what amounted to practically a complete urinary shut-down, passing about four ounces per twenty-four hours. During this time the pain and tenderness in the upper quadrant disappeared. She was very drowsy and in fact slept most of the time. She complained of "heaviness in her eyes" and of constant, severe headache. There was continual vomiting and not even water was retained. During this time there was no edema anywhere and this despite the fact that she was receiving from 4000 to 5000 c.c. of fluid in the form of saline subpectorally and glucose intravenously. Spinal anesthesia was administered on two occasions on the advice of the medical consultant who thought that the condition might be due to spasm of the renal vessels, but the results were very meager. The pulse and temperature remained normal. The small amounts of urine passed showed a large amount of albumin and many leucocytes; no red blood cells were obtained after the first specimen and there were likewise no casts. Edema of the face was noted on the eighth day; nonprotein nitrogen was 120 mg. per 100 c.c.

On the tenth day, seven days after the onset of anuria, she passed twenty ounces of urine, the first appreciable amount for a week. Curiously enough, simultaneous with this commencing to void, the patient developed a generalized edema. Constant vomiting and headaches continued while she remained very restless, responding to the slightest stimuli. Examination of the chest at this time showed beginning pulmonary edema. The urinary output continued to increase until very large amounts were passed, averaging 190 ounces per twenty-four hours. This urine was very pale, had a low specific gravity, showed a trace of albumin, and had a few white blood cells in the sediment. The nonprotein nitrogen came down to 114 mg. and the blood sugar was 111 mg. per 100 c.c.

On the thirteenth day the edema of the body and lungs had cleared up but the patient still retained her pasty appearance and still complained of severe headaches, vomiting frequently. On the sixteenth day, despite a large urinary output, her condition was much worse. The pulse was weak and irregular, there was marked muscular twitching of the hands and face, constant headache, and hypersensitivity to even the slightest noise. Mentally she was clear. Her blood pressure was 140/100 and the nonprotein nitrogen content of the blood was 95 mg. per 100 c.c. There was no edema and although the urine showed a slight trace of albumin there was no blood in the urine and no casts. She continued to grow worse and died eighteen days after the transfusion without ever having had any period of coma or any true convulsions. Permission for a postmortem examination was obtained.

*Postmortem Examination.*—The peritoneal cavity contained 2000 c.c. of clear amber-colored fluid and the wall of the stomach was edematous. There was moderate edema of the lower lobes of both lungs.

The liver edge was not visible below the costal margin. The liver was smooth, slightly enlarged, and soft. The surface was reddish brown and covered with a fine lacework of purple and brown petechial hemorrhages. On cut section the liver was

found to be moderately friable and tiny hemorrhages were present throughout the parenchyma. Normal markings were present.

The kidneys were both enlarged. The fatty and true capsules stripped with ease, leaving a gray, smooth surface covered with congested venules. On section the cortex varied in width from 5 to 7 mm. The cortex was gray and contained many petechial hemorrhages which tended to radiate to the surface. The markings of the medulla were accentuated and purple in color; they tended to radiate peripherally in fan-like pattern. The right pelvis and ureter were moderately dilated. The pelvic fat was normal. The adrenal cortices were filled with flame-shaped hemorrhages which radiated centrifugally.

Microscopic examination (by Dr. Frank B. Mallory) showed the alveoli at the bases of the lungs filled with coagulated serum and many monocytes. The venules in the alveolar walls were congested but there was no evidence of pneumonia. Cultures taken from the bases of both lungs showed *Staphylococcus aureus* and *Streptococcus hemolyticus*. The pathologists placed no particular significance on this latter observation. Culture of the heart blood was negative. The only lesions having any bearing on the case were found in the liver, adrenals, and kidneys. The liver showed focal areas of hemorrhagic necrosis with infiltration of polynuclear leucocytes and vacuolization of liver cells, quite similar to the degenerative processes found in the liver of eclampsia. The adrenals showed similar focal areas of hemorrhagic necrosis. (Dr. Parker of the Pathology Department has seen similar lesions in the liver and adrenals of anaphylactic animals.) In the kidneys the glomeruli were found to be normal. The tubules showed a marked hemoglobinuria with evidence of regeneration of tubular epithelium which had been severely damaged. There was no evidence of chronic nephritis.

The anatomic diagnosis was hemoglobinuric kidneys, petechial hemorrhages in liver and adrenals, ascites, and pulmonary edema.

#### SUMMARY

We have presented 3 cases of secondary anemia severe enough to require immediate transfusion. Two of the patients manifested a systemic reaction not later than half an hour after transfusion and all 3 patients showed a fairly similar delayed reaction. In no instance was there any reaction during the injection of the blood. The smallest amount of blood given was 420 c.c., and both the citrated and whole blood methods of transfusion were used.

The characteristics of the immediate reaction were a sense of discomfort, nausea, chill, dyspnea, and rapid pulse. These symptoms subsided in about twenty minutes. The delayed reactions began about forty-eight hours after transfusion and were characterized chiefly by urinary suppression, concentrated urine with a very heavy albuminuria, and hemoglobinuria. The bedside picture was that of slight jaundice, uremic manifestations with drowsiness, coma, muscular twitchings, and convulsions. The nonprotein nitrogen content of the blood was considerably elevated in each instance.

The blood compatibility was tested by cross-agglutinating the patient's serum with the donor's cells. In addition to the cross-agglutination the blood group was also established in Case 2. In Case 1, in which the patient recovered, a repeat cross-agglutination done at the time of the

patient's discharge from the hospital showed incompatibility by the same method which had showed no agglutination before the transfusion. Repeat cross-agglutination tests were confirmatory in showing compatibility in the other two patients, both of whom died.

The treatment was conservative in all 3 patients and consisted simply of forcing fluids by hypodermoclysis and by intravenous routes, together with general supportive therapy. In no instance did the condition of the patient seem to warrant operative interference for decapsulating the kidneys, such as was successfully performed by Baneroff.<sup>2</sup>

Permission for an autopsy was obtained in only one case, that of Case 3. Areas of hemorrhagic necrosis were found in the liver and adrenals. The kidney glomeruli were normal. There was marked hemoglobinuria in the tubules with evidence of regeneration of tubular epithelium which had been severely damaged.

The underlying cause of these severe reactions is not entirely clear. Two possible explanations are, (a) anaphylactic shock, (b) toxins liberated by transfused blood cause severe kidney damage.

Grouping both donor and recipient, and cross-agglutinating the donor's serum with the cells of the recipient, as well as vice versa, cannot be emphasized too strongly.

#### REFERENCES

(1) *Bordley, James*: Reactions Following Transfusion of Blood, With Urinary Suppression and Uremia, *Arch. Int. Med.* 47: 288, 1931. (2) *Baneroff, F. W.*: Anuria Following Transfusion; Effect of Decapsulation of Both Kidneys, *Ann. Surg.* 81: 733, 1925.

75 WEST MAIN STREET, MARLBOROUGH.

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## DIRECT INTRAABDOMINAL RADIATION IN ADVANCED PELVIC CARCINOMA\*

EDWARD A. SCHUMANN, A.B., M.D., F.A.C.S., PHILADELPHIA, PA.

(From the Kensington Hospital for Women)

THIS is a preliminary report of a procedure designed to further the attack upon advanced pelvic carcinoma by applying roentgen rays directly to the affected tissues without the intervention of the abdominal parietes. The procedure is carried out in connection with the implantation of radium in the cervix or the uterine cavity as the case may require and has only been applied in instances where the entire pelvis is a mass of carcinomatous tissue with extension into the adjoining lymph nodes. The operation has been attempted upon three women without any postoperative complication or any particular discomfort to the patients. Details of the histories are attached.

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\*Read at meeting of the Obstetrical Society of Philadelphia January 5, 1933.

The technic of the procedure is as follows:

Under avertin anesthesia the patient is placed in the lithotomy position, biopsy is performed, the nature and extent of the carcinomatous infiltration is determined by bimanual examination and 50 mg. of radium are applied to the cervix or to the uterine cavity, with such filtration as is deemed appropriate for the individual case. The patient is then placed in the Trendelenburg position, the abdomen is prepared as usual for laparotomy, a median incision 6 to 8 inches in length is made, and the abdominal walls are widely separated by means of a Balfour retractor. The intestines are carefully walled off with a large gauze pad, after which the abdominal wall and all the pelvic tissues except those involved in the malignant growth are protected from irradiation by being covered with sheet lead, 2 mm. in thickness.

A roll of such sheet lead and large heavy scissors are in readiness, having been sterilized by boiling. Strips of lead are cut to fit the interior of the abdomen and are then snugly moulded into position (with the fingers) so as to isolate the tumor area absolutely, all other tissues being covered by strips of lead.

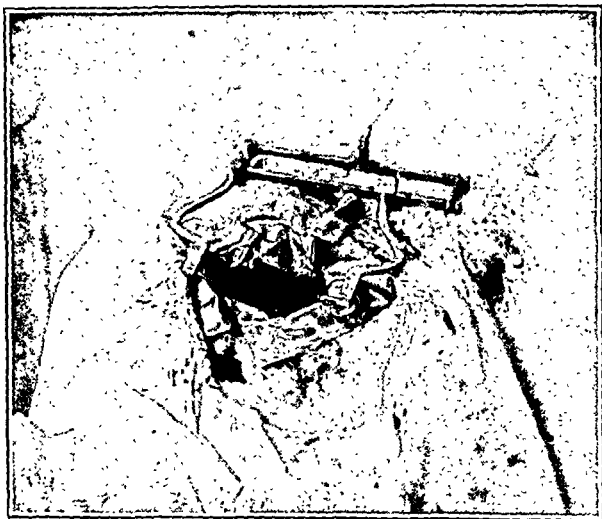


Fig. 1.—Field of operation ready for irradiation. Lead strips are clearly shown, protecting the viscera.

A large sterile dressing is then applied and the patient transported to the x-ray room where she is given a full therapeutic dose of x-ray; i.e., 150 ma. 18" distance, 130 K.V., 6 mm. aluminum filtration.

Upon the completion of the treatment the sterile dressing is replaced, the patient is wheeled back to the operating room, the lead and gauze packs are removed, and the incision is closed. No attempt whatever is made to remove any of the malignant tissues.

The operation is much facilitated when a light and simple operating table is used and avertin is the anesthesia of choice, because the patient lies quietly asleep during the entire procedure and time is not a particular factor.

This method of approach is suggested as being worthy of trial, and will be continued at Kensington Hospital until a definite series of cases may be assembled. Details of the three cases already treated follow.



CASE 1.—Miss C. R., aged forty-four years. Admitted July 2, 1932, and discharged July 31, 1932. There was history of septic abortion twenty years previously. Patient complained of vaginal discharge for past three years, being mucopurulent since March, 1932, and she had had vaginal bleeding with passage of foul-smelling clots since June, 1932. Pain in R.L.Q. for past three years. Constipation, anorexia, flatulence, and excessive weight loss in past three months.

*Physical Condition.*—B.P. 148/90; wasted and cachectic but ambulatory. Physical examination was negative, except for pelvis and abdomen. Hb., 55 per cent; R.B.C., 3,090,000; W.B.C., 12,400. The "frozen pelvis" was acutely tender; cervix showed cauliflower excrecences and bled on trauma. Mass rose in abdomen nearly to the umbilicus. Marked inguinal adenopathy. Advanced carcinoma of the cervix.

*Treatment.*—July 12: Laparotomy and x-ray irradiation; avertin anesthesia. One dose 175 ma. 20" distance, 6 mm. albumin filtration, 130 K.V.

July 29: Out of bed, much stronger, no bleeding but running temperature of 100° to 100.6° F.

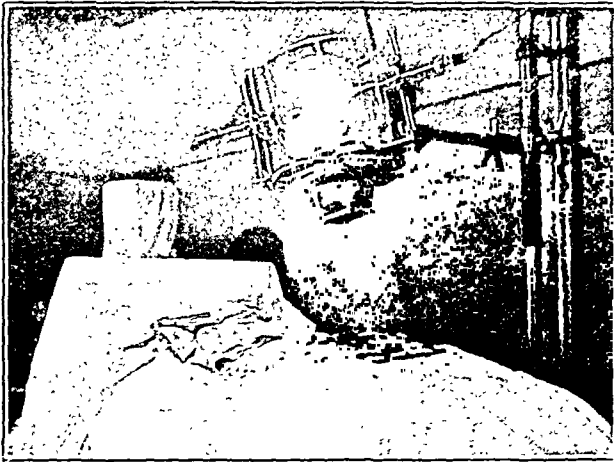


Fig. 2.—Application of the x-ray treatment. Patient in moderate Trendelenberg position under avertin anesthesia.

July 31: Discharged, but did not return for further treatment and was reported in moribund state in January, 1933.

*Pathologic Diagnosis.*—Advanced carcinoma of the cervix.

CASE 2.—Mrs. A. T., aged fifty-six years. Admitted July 2, 1932; discharged Aug. 16, 1932. History of "pelvic disease" twenty-eight years previously; one normal pregnancy in 1899. Patient complained of vaginal discharge and irregular bleeding for past five months, with bleeding daily for past month. Menopause two years before. Lower abdominal pain for past month. No weight loss.

*Physical Examination.*—Obese, white female not acutely ill, but appearing somewhat anemic. Outlet multiparous; cervix was large, hard, and smooth. Bleeding from cervical os. Uterus was large, fixed, and very hard. Adenocarcinoma of the fundus uteri.

*Treatment.*—Aug. 2, 1932: Dilatation and curettage, and insertion of 50 mg. of radium into the fundus under avertin anesthesia. One millimeter each of brass and rubber filtration; seventy-two hours' irradiation. Much foul necrotic tissue was removed. Laparotomy was performed, followed by x-ray irradiation. Postoperative course was uneventful. Patient was out of bed in twelve days and home on the fourteenth day. Subsequent deep x-ray irradiation.

Sept. 6, 1932: Dosage repeated five times, every other day.

Nov. 30, 1932: Two treatments anterior; two, posterior.

*Pathologic Report.*—(1) Adenocarcinoma of the fundus of the uterus, Grade III, and (2) secondary acute inflammation.

CASE 3.—Mrs. A. B., aged fifty-three years. Admitted Aug. 3, 1932; discharged Aug. 26, 1932. *Familial history* of carcinoma of liver, stomach (2 cases), and carcinoma of throat (2 cases). Six full-term normal deliveries and recoveries, and occurrence of menopause a "few years ago." Loss of thirty pounds' weight in past year.

*Complaint.*—Irregular bleeding beginning in July, 1931, which decreased in the winter following, but recurred more severely in May, 1932.

*Physical Examination.*—B.P., 120/60; Hb., 45 per cent, R.B.C., 2,970,000; W.B.C., 16,100. Patient, rather wasted, cachectic, highly nervous, appeared acutely ill. Outlet parous, bleeding visibly, cervix deeply invaded on right side by deep crater. Uterus was rigidly fixed and extremely tender. Advanced carcinoma of cervix, Grade IV.

*Treatment.*—Aug. 5: Laparotomy and x-ray irradiation through incision; avertin anesthesia. Uterus which was the size of a grapefruit, was thin-walled and ruptured during manipulation, liberating large quantity of foul pus. Large amount also escaped through the cervix. Closed without drawing.

*Postoperative Course.*—Uneventful. On Aug. 23, after being out of bed for two days, the cervix was dilated gently to promote better drainage of the pyometra. Patient was discharged Aug. 26 much improved. Bleeding had ceased. Patient has not returned to follow-up clinic, but her physician reports she has no pain or bleeding.

## DISCUSSION

DR. J. DONALD ZULICK.—The administration of x-rays directly to the uterus through the opened abdomen is not a difficult problem from the x-ray standpoint. The point is: Are we justified in doing it? Radiologists, at least, all agree that radiation is the only means of treatment that offers any hope of palliation in these advanced cases. They do not agree, however, as to whether it is better to administer an intensive dose in one treatment, or fractional doses through multiple ports of entry, gradually bringing the dose up to saturation and maintaining it there for some time. Good results have been obtained by both methods.

One of the advantages of the method described by Dr. Schumann is that a full dose of x-rays is administered at once and then in about two weeks' time the saturation method can be carried out through skin which has not been previously exposed to x-rays. Unfortunately, it takes many years to establish the efficacy of any kind of cancer treatment and I feel that unless we can show results that are unquestionably better, we will not be justified in continuing this method which carries with it the added danger incident to the anesthetic and the opening of the abdomen.

## AN UNUSUALLY LARGE OVARIAN CYST\*

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**E**NORMOUS cysts are seldom seen today, modern surgery being responsible for their early removal. The present case is reported simply because the cyst was the largest I have ever seen.

Mrs. G. S., aged fifty-six years, was admitted to the Medical Service of the Long Island College Hospital on July 27, 1932, with the following history: She married at the age of twenty, had one boy thirty-one years ago, followed by three induced abortions from which she had normal convalescences. She had several minor sicknesses which are not relevant to the present condition. Two years previously at the age of fifty-four her menstruation ceased, and she thought she was at the menopause. She noticed, however, that her abdomen had been getting larger and consulted a physician who told her that she was eight months pregnant and that she had a breech presentation. He tried to do an external version but failed. When he thought she was at term, he took her to a private hospital and had her prepared for cesarean section. At the last minute she refused operation and left the hospital of her own accord. Her abdominal enlargement had steadily increased. For years she had had a mild indigestion but for the past two months she had increasing heartburn and acid eructations. Four weeks before admission the ingestion of any food other than fluids in very small amounts, was followed by vomiting. Dyspnea had been marked for the past two months; she had been unable to lie down, sleeping in the sitting position. For the past three months she had noticed that her arms and face were getting progressively thinner and that marked edema of the legs began about the same time.

Her condition on admission is best shown in Fig. 1, although she refused to expose her face, the expression of which was most striking. Her abdomen measured 31 inches from ensiform to pubis and 61 inches in circumference. The essential physical findings were as follows: Face, arms, and chest showed marked pallor with subicteroid tinge to the skin and marked emaciation. Examination of the heart, revealed the apex beat in the fourth space, 11 cm. from the midsternal line practically in the anterior axillary line. The heart sounds were good. Lungs showed shallow respiratory movements. There was dullness from the angles of both scapulae downward and in the axillae at the same level. The liver dullness began at the fourth rib. The abdomen was enormously distended; the wall was tense and edematous and there were many enormously dilated vessels front and back. A fluid wave was present and no areas of intestinal tympany could be elicited. The legs were enormously edematous. The temperature was 99° F., pulse 100, respiration 28, blood pressure 94/70, R.B.C. 3,500,000, W.B.C. 7,000, hg. 30 per cent, with marked achromia and microcytosis. Blood chemistry showed a moderate nitrogen retention; urine was negative; blood was negative by both the Wassermann and the Kahn tests, and the electrocardiograms showed moderate myocardial degeneration. Diagnosis of hepatic cirrhosis was made and a paracentesis through a small trocar was done on July 30. The fluid obtained was pseudomucinous and of a brownish color. The resident physician, realizing that something was wrong, sent to the Gynecological

\*Presented to the New York Obstetrical Society, January 10, 1933.

Department for consultation. The fluid was running out very slowly and we advised that as much fluid be very slowly removed as the patient could stand. Nine gallons were removed during the course of twelve hours. She seemed very comfortable during this time, ate dinner and supper and had a good night following the withdrawal of the trocar. The next day the condition was very much improved and she was much more comfortable. This procedure seemed to have about half emptied the abdomen and, as she continued to improve, a second paracentesis was done on Aug. 7, when six gallons of fluid were removed. Then the tumor could be palpated and several irregular solid masses could be detected.

She began to show marked improvement and her appetite became enormous; she had been practically starved before. The daily improvement was remarkable. She



Fig. 1.

received five transfusions averaging 300 c.c. She improved so rapidly that on Aug. 29, she felt she could stand an operation, the hg. then being 65 per cent. This was done the next day under modified twilight sleep and light gas oxygen anesthesia. The cyst presented the typical appearance of a pseudomucinous cyst adenoma. The trocar was inserted and two gallons of fluid were withdrawn by suction, making a total of seventeen gallons. The collapsed wall was found to be adherent to the parietal perineum, intestine, omentum, and to the inferior surface of the liver. These adhesions were separated and tied without difficulty except that from the inferior surface of the liver there was a slight hemorrhage which was controlled by hot laparotomy pads. Because of the solid areas of the tumor and because the right ovary was also enlarged and cystic, as shown in Fig. 2, the possibility of malignant change was borne in mind. A small uterus and cystic right ovary were removed with the cyst which was of the left ovary.

The pathologic report is as follows: Uterus was markedly atrophic and measured after fixation 6 cm. in length, 4.5 cm. transversely at the level of the round ligaments, and 3 cm. in the anteroposterior axis. Symmetry was normal. The serous coat was smooth and grey. On incision the uterine cavity was dilated by a pedunculated submucous fibroid located on the posterior wall and measuring 1.5 cm. in



Fig. 2.



Fig. 3.

diameter. The overlying mucosa was soft and edematous. An endometrial polyp arising from the right lateral wall coursed transversely, measuring 15 by 8 by 3 cm. This encroached upon the internal os. The myometrium was atrophic and measured 18 mm. in thickness. Microscopically, the endometrium showed advanced atrophy.

The lining epithelial layer was only occasionally seen. The stroma was scant. The glands were few in number and small in size. The lining cells were of the low columnar type. The myometrium showed marked atrophy of its muscle fasciculi. Sinusoids were frequent and were of large size, indicative of pressure. The medium- and large-sized arteries showed mural and subintimal sclerosis. There was a slight increment in the connective tissue ratio. The muscle cells were small; cytoplasm was scant. The nuclei were pale and elongated. Focally, the intimal layer was swollen and fatty. This was the result of previous radiation. The veins showed thickening of the adventitia with fraying of the muscle in the intima and media. The serous coat was normal. No studies were made of the polyp or submucous fibroid. Diagnosis: Atrophy of uterus, senile and from radiation, endometrial polyp, submucous fibromyoma. The left tube had been converted into an Indian-club shaped hydrosalpinx which measured 8 cm. across the narrowest arc. The right tube was markedly elongated, roughly 23 cm. in length, as the result of pressure by the huge ovarian cyst over the superior pole of which the elongated tube was stretched. The right ovary was converted into a huge round cyst which roughly measured 30 cm. in diameter. The superior aspect was slightly lobulated due to collections of daughter cysts within the central cavity. These varied in dimension from 5 to 25 mm. The tube and attenuated broad ligament coursed over its superior pole. The lateral aspect was similarly covered with adhesions. Fine punctate hemorrhages were irregularly distributed. Collections of daughter cysts were irregularly distributed, producing secondary semisolid tumors varying from 10 to 15 mm. in diameter. Microscopically, the lining epithelium was comprised of a solitary layer of tall mucous secreting goblet cells. Focally, ulceration had occurred. The granulation tissue was covered with mucin. At these sites the fibromuscular wall contained scattered neutrophils and collections of lymphocytes and plasma cells. The supporting wall was largely comprised of hyalinized connective tissue. Diagnosis: Pseudomucinous cyst adenoma.

The patient stood the operation well, received the usual routine postoperative treatment of saline hypodermoclysis and intravenous glucose. She made a very rapid recovery and was discharged on Sept. 19, twenty days postoperative.

#### COMMENT

One does not like, of course, to do a paracentesis on an ovarian cyst, but I am convinced that this woman's life was saved by that procedure. Her condition on admission was desperate and it seemed to us that in no other way could we hope for a favorable result, although the first paracentesis was done in a justifiably erroneous diagnosis.

176 STATE STREET.

## TORSION OF THE NORMAL FALLOPIAN TUBE\*

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(From the Surgical Department, Jewish Hospital)

**T**ORSION of the uterine adnexa is not uncommon, many cases having been reported in the literature. Both ovary and tube are often involved in the torsion, and some definite pathologic lesion is usually present as the underlying cause. However, primary volvulus of a normal, undiseased fallopian tube alone is a rare occurrence and forms the basis of this report.

The attention of the profession was first drawn to torsion of the adnexa by Bland-Sutton<sup>1</sup> in 1891 at which time he described a case of a large hydrosalpinx which had undergone a torsion of three and a half turns. Since Bland-Sutton's case numerous reports have appeared in the literature, and mainly in cases where the cause was some lesion of the tube or ovary or both. In 1912 Anspach<sup>2</sup> collected and reviewed about 95 cases of adnexal torsion from the literature, the vast majority being attributable to a pyo- or hydrosalpinx. Only 13 of his cases were found in virgins, and even here the author believed that some preexisting infection, probably from childhood, such as a vulvovaginitis, may have existed.

Smith and Butler,<sup>3</sup> 1921, reviewed the literature and found only 25 cases of torsion of ovarian tumors *before puberty*, only 14 cases of torsion of normal adnexa (tube and ovary or both) at any age, and only 5 cases involving the fallopian tube alone. Many reports have been made in the past five years where torsion occurred, but there was present some lesion either of the involved adnexa or that of the opposite side. Thorek,<sup>4</sup> 1927, reported an interesting case in a girl of fourteen years with a typical symptomatology of acute appendicitis which diagnosis was made; on operation the right tube was found distended with blood and twisted 3 times to the left; the left ovary was enlarged and cystic, and is therefore not to be considered a case of torsion of undiseased adnexa. For similar reasons the cases reported by Douglas<sup>5</sup> 1928, Wachtel<sup>6</sup> 1928, and Nicholson<sup>7</sup> 1929 are not included, in spite of the lesion being only insignificant.

Darner,<sup>14</sup> 1926, reported 6 cases including one of his own where no pathologic lesion of tube or of adjoining adnexa was found that might have been the cause of the torsion. His own case is of interest because it has some features in common with the case to be reported here. His patient was a girl of thirteen years, who had a sudden onset of pain in the lower abdomen for five days before admission, nausea was present, but no vomiting, no rigidity, and no acute tenderness over McBurney's point. Rectal examination revealed a putty-like, tender mass in the right fornix; the urine was negative and the leucocyte count 14,800. The diagnosis was acute appendicitis with abscess. A laparotomy was performed and blood-tinged fluid was found in the peritoneal cavity, the appendix was normal, but the distal  $\frac{1}{3}$  of the right tube was distended and bluish black, the medial and proximal  $\frac{2}{3}$  twisted clockwise three and a half times. A right salpingectomy was done and the patient made an uneventful recovery.

Gabe,<sup>8</sup> 1929, stresses the point that distinction should be made between torsion of a "normal virginal tube" and that of married women, i.e., one in which no

\*Read at a meeting of the Obstetrical Society of Philadelphia, December 1, 1932.

finding of infection is present on examination of the tube, and in which there is no history of pelvic infection. His case is that of a girl thirteen years of age, menarche at eleven and regular, who had acute onset of pain in the right lower quadrant, nausea, and vomiting with tenderness over McBurney's point. Urinalysis was negative, the leucocyte count 18,000 and 78 per cent polymorphonuclears. The case was diagnosed acute appendicitis. On operation free blood-stained fluid was present, the appendix was not diseased, the right tube was twisted 4 cm. from the uterine junction and two and a half turns, the strangulated, bluish mass was removed with the tube. Both ovaries and the other tube were normal. The patient was discharged in good condition.

Ahumada and Prestini<sup>9</sup> 1929 believe that torsion of the "normal" tube is favored by hypoplasia of the tube with relaxation of its supporting ligaments. They report one case where the history and subsequent findings revealed no cause for the torsion.

Koster,<sup>10</sup> 1929, reports one case in a girl of sixteen years which can be included in the grouping of cases of torsion of an undiseased fallopian tube. Michon<sup>11</sup> reports 3 cases of tubal twists alone where he found no lesion present to explain the torsion; he gives several explanations of his own which are mentioned at another point in this report.

Mange,<sup>12</sup> 1931, reports a single case in a woman aged forty-one. Downer and Brines,<sup>13</sup> 1931, in order to eliminate any possibility of an inflammatory lesion, limited their cases to girls under sixteen years and unmarried, and they found only 6 cases in the literature where a normal tube alone had undergone torsion. Their own case was in a patient aged seven years, and involved the left tube which was twisted 5 times. Shute,<sup>15</sup> 1932, has reviewed the literature on torsion of the adnexa, and includes in his article torsion under practically every condition. He does not discriminate very clearly between torsion of a normal tube alone and torsion of both tube and ovary. Most of the case reports mentioned by Shute have some definite pathologic factor as a basis; his own cases, 6 in number, all reveal some pathology of either the tube or the ovary. Torsion of the adnexa, particularly of pathologic adnexa, is, as Shute writes, not at all uncommon; however, the case to be reported here is limited to torsion of a normal fallopian tube alone without involvement of the ovary on the same side or of the opposite adnexa, and is extremely rare. Using Downer and Brines' method of limiting the cases, the case to be reported by the present writers becomes the seventh.

#### CASE REPORT

H. L. S., a well-developed white girl, thirteen years of age, with a history of having been perfectly well until about four hours before admission when she was awakened from her sleep by an acute, sharp pain in the lower right quadrant, no urinary symptoms, but nausea and vomiting occurred in about an hour after onset of pain. No dietary indiscretion was present. There were no chills and no fever; pain increased in severity until time of operation. The patient had not begun to menstruate. The past history was negative; there was no vaginal discharge. There was rigidity of both recti muscles, especially the right, an extreme tenderness over McBurney's point. The urinalysis was negative; the leucocyte count 15,000 with 82 per cent polymorphonuclears. Rectal examination was negative. A diagnosis of acute appendicitis was made. The patient was operated upon under nitrous oxide-oxygen anesthesia through a McBurney incision and when the peritoneal cavity was opened a small amount of bright free blood was found. The appendix appeared fairly normal, but was removed. The right adnexal region was explored after enlarging the incision, and the right fallopian tube was found twisted on itself in a



counter-clockwise direction two and a half turns at a distance of about  $1\frac{1}{2}$  inches from the uterine attachment at the outer end of the ovary. The end of the tube was dark red, gangrenous and about the size of a hen's egg, and full of blood. The tube was untwisted, ligated at the point of torsion and resected. The right ovary was pale and infantile in character and not involved in the torsion. The uterus, left tube and ovary were normal. The patient made an uneventful recovery and was discharged from the hospital on the ninth day.

Section of tissue showed almost total destruction of the lining mucosa of fallopian tube. Edema and hemorrhagic congestion of tubal wall. Blood vessels engorged. Large areas of blood clots were seen. The picture was that of cellular destruction due to strangulation rather than an inflammatory process.

#### REFERENCES

- (1) *Bland-Sutton, J.*: Surgical Diseases of the Ovary and Fallopian Tube, London, 1891, p. 257. (2) *Anspach, B. M.*: Am. J. Obst. 66: 553, 1912. (3) *Smith, R. R., and Butler, W. J.*: AM. J. OBST. & GYNEC. 2: 507, 1921. (4) *Thorek, M.*: M. J. & Record 125: 470, 1927. (5) *Douglas, M.*: AM. J. OBST. & GYNEC. 16: 210, 1928. (6) *Wachtel, M.*: Zentralbl. f. Gynäk. 52: 1453, 1928. (7) *Nicholson, E.*: Bol. Soc. de Obst. y Ginec. de Buenos Aires 7: 197, 1928; Abst. Internat. Abst. Surg. 49: 128, 1929. (8) *Gabe, W. E.*: Arch. Surg. 18: 1304, 1929. (9) *Ahumada, J. C., and Prestini, O.*: Bol. Soc. de Obst. y Ginec. de Buenos Aires 7: 194, 1928; Abst. Internat. Abst. Surg. 49: 128, 1929. (10) *Koster, H.*: Am. J. Surg. 7: 67, 1929. (11) *Michon, L.*: Gynec. et Obst. 21: 103, 1930; Abst. Internat. Abst. Surg. 51: 315, 1930. (12) *Mange, I.*: Bull. Soc. d'Obst. et Gyn. de Paris 20: 575, 1931. (13) *Downer, I. G., and Brines, O. A.*: AM. J. OBST. & GYNEC. 22: 665, 1931. (14) *Darner, H. L.*: AM. J. OBST. & GYNEC. 11: 368, 1926. (15) *Shute, E.*: Am. J. Surg. 16: 490, 1932.

MEDICAL ARTS BUILDING  
NORFOLK APARTMENT

## ABRUPTIO PLACENTAE (COMPLETE) WITH SPONTANEOUS PARTIAL RUPTURE OF THE UTERUS\*

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THE case to be reported is one of abruptio placentae with concealed hemorrhage occurring in the last quarter of pregnancy with spontaneous partial rupture of the uterus, in a cardionephritic patient, and complicated postoperatively by bronchopneumonia, with recovery.

Mrs. G. L., thirty years of age, white, Hebrew, para ii, gravida v, was admitted to the Brooklyn Women's Hospital on February 11, 1932. Past history was irrelevant. No history of diphtheria or scarlet fever. Her family history was essentially negative. Catamenia began at the age of thirteen, is of the twenty-eight-day type, and lasts for two days, with no dysmenorrhea. She married at the age of twenty-three and has had 2 miscarriages, each of which was spontaneous and each at the end of three months, with no sequelae. She has had two full-term pregnancies with normal deliveries and puerperia. The first child died at the age of eleven weeks, presumably of pneumonia. The second is living and is about three years of age.

Her last menstrual period was on June 15; labor was calculated as of March 22, 1932.

\*Presented at a meeting of the Brooklyn Gynecological Society, December 2, 1932.

Unfortunately, she came to the antepartum clinic only once, and that was just two days prior to admission, at which time the blood pressure was 115/70, weight 137½ pounds; there was edema of the ankles; fetus in L.O.A. position, cephalic presentation; fetal heart heard in left lower quadrant; urine 4-plus albumin, with moderate hyaline casts, otherwise negative.

Labor began at home at 2 A.M. on February 11. Patient was admitted to the hospital at 7:45 A.M., on the same day, having moderate, regular, rhythmic contractions occurring every ten minutes. Examination showed a poorly developed and undernourished woman about thirty years of age, of low mentality. Her face was pock-marked and sallow. Apex beat in the midclavicular line, with heart sounds of only fair quality. The lungs were negative. The uterus corresponded in size to that of an eighth month gravidity, with the fetus in L.O.A. position, cephalic presentation. Fetal heart sounds in the left lower quadrant, fair quality and normal rate. Rectal examination showed cervix one finger dilated, membranes intact, head unengaged. Blood pressure 130/90, temperature 99, pulse 88, respiration 20. Urine analysis: acid reaction, three-plus albumin, occasional red blood cell and many white blood cells. Wassermann and Rosenthal tests were negative.

Repeated rectal examinations during the subsequent sixteen hours after admission found her cervix dilated three fingers with strong rhythmic, intermittent contractions. Head continued unengaged, membranes were not ruptured, fetal heart ceased to be heard. Morphine sulphate, gr. ¼, magnesium sulphate, 2 c.c. of a 50 per cent solution, were administered. Fluids were forced, with plenty of fruit juices. Blood pressure readings during this time ranged from 130/90 to 120/100. Temperature 99° F., pulse 80 to 90.

At 7:45 A.M., twenty-four hours after admission, the resident physician reported as follows: rectal examination showed cervix almost fully dilated. Blood pressure 120/90. Head still unengaged. Patient having strong contractions. Fetal heart questionable.

At 10:45 A.M., the patient complained to the nurse in charge, of a sudden excruciating pain in the abdomen, which radiated to the sides of the abdomen, and she was gasping for breath. Being in the hospital at the time, I was immediately summoned to the labor room and found the patient in shock: skin cold and clammy with a profuse perspiration on the forehead, dilated alae nasi, and pallor of the lips and mucous membranes. Respirations were labored. Pulse was weak, thready, and rapid. The heart sounds were of poor quality, rapid with marked accentuation of the second pulmonic sound and a faint aortic sound. Râles were present in both lungs posteriorly at the bases. She had severe continuous pains in the abdomen and in both flanks. There was no epigastric distress and no upper abdominal rigidity, though the abdomen was tense, distended, and tender to touch. The uterus presented a boardlike rigidity, giving one the impression of being tetanically contracted. The fetal heart was not heard.

Vaginal examination showed cervix one finger dilated, tender, and rigid. Head ballotable and still unengaged. No evidences of any external bleeding. Temperature 100° F., pulse 140, respiration 34, blood pressure 140/100. A diagnosis was made of an abruptio placentae with concealed hemorrhage and possibly an impending rupture of the uterus. Treatment for shock was immediately instituted. Catheterized specimen of urine at this time continued to show three-plus albumin, and red and white blood cells. Blood count: R.B.C. 2,780,000, hg. 56 per cent, W.B.C. 16,900, polymorphonuclears 80 per cent, leucocytes 20 per cent.

At 1 P.M., three hours later, the hg. had receded to 40 per cent; blood pressure was 90/30, pulse 120, of fair quality. Fetal heart not heard. Abdomen still very tense and under ligneous. She had, however, rallied sufficiently from her initial shock to consider operative interference.

I performed a classical cesarean section under local anesthesia (novocaine  $\frac{1}{2}$  per cent). Free blood was found in the abdominal cavity. The uterus was firmly contracted, though no thinning of the muscle at any one region was detected. A rent was seen on the anterior fundal surface, extending through the serosa and its sub-jacent muscular tissue.

The laceration was about 6 cm. long and 1 cm. wide. The uterus appeared purplish with definite areas of extravasation of blood under the serosa. The tubes and ovaries were grossly apparently normal. A longitudinal incision was made through the lower half of the uterus and a macerated fetus removed. There was a large clot between the placenta which lay directly behind the laceration and was completely detached. The uterus, right tube, and ovary were removed by the clamp and ligature method. Intravenous glucose and saline were given during the operation. This was followed by 450 c.c. of whole blood Type II (Moss).

*Pathologic Report* (Dr. Goldzieher).—Previously globus uterus, partly contracted with somewhat boggy consistency, resembled well-advanced gravid uterus. There was slight intraligamentous hemorrhage in the right adnexa. On the anterior fundal surface a 7 cm. long and 1 cm. wide laceration of the serosa and subjacent uterine musculature for a distance of 6 to 8 mm. was noted.

Uterine wall reached average thickness of 3 cm. and showed no evidence of thinning out. On posterior aspect the myometrium was stained an odd brownish color along a thin layer beneath the serosal coat which may be the site of extravasated blood.

Microscopic examination showed ordinary myometrium with no pathologic changes.

On the third day the patient's R.B.C. count rose to 3,200,000 from the previous count of 1,800,000 and the hg. to 61 per cent from 36 per cent. On the fourth day postoperative, the patient experienced a severe chill, complained of pain in the chest, dyspnea, and cough. Temperature rose to 105° F. Examination of the chest revealed the presence of bronchopneumonia. Her subsequent postoperative course was that of recession of temperature by lysis. Sutures were removed on the eighth day with wound healing by primary union. The patient was discharged on February 27, sixteen days after admission.

In her follow-up at the clinic, her urine still showed a three-plus albumin, with moderate amount of hyaline casts, and many red and white blood cells. Blood count 3,500,000, hg. 73 per cent, blood pressure 120/90.

A vaginal smear taken at her last appearance at the clinic, showed *Trichomonas vaginalis*.

536 SARATOGA AVENUE.

# REPORT OF THREE CASES OF RUPTURE OF THE UTERUS FOLLOWING PREVIOUS CESAREAN SECTION\*

JOHN CASAGRANDE, M.D., BROOKLYN, N. Y.  
(From the Obstetrical Service of Brooklyn Hospital)

AT THE Brooklyn Hospital during the last ten years, 160 cesarean sections have been done, 51 patients having been previously sectioned, among which were 3 cases of ruptured uterus in subsequent pregnancies.

The first patient was thirty-seven years old, para ii. Her previous history included a classical section done at the Brooklyn Hospital in 1919, for a pregnancy complicated by a placenta previa. Her postpartum course was febrile for sixteen days and for at least two weeks she had abdominal pains and a foul lochia. While there was no infection of the abdominal wound, the postpartum course indicated that there was infection, probably involving the uterine wound. She was discharged on the thirtieth day postpartum. The second pregnancy terminated in a spontaneous breech delivery in 1925, with no postpartum complications. The present history began at the patient's home on April 15, 1927, with a sudden attack of sharp pain in the abdomen which persisted, and she fainted several times. There were no labor pains or bleeding, and the expected date of labor was not until April 20. She then presented the picture of considerable shock, with pallor, pale lips, and cold extremities. The pulse was very weak and rapid, the rate 132, and the blood pressure was unobtainable. She was sent to the hospital and an immediate operation was performed. The placenta was found protruding through the center of the former wound in the uterus. There was considerable blood in the peritoneal cavity. After rupturing the membranes, a dead fetus, weighing eight pounds and nine ounces, was extracted. The edges of the uterine wound were freshened and sutured with interrupted catgut. A blood transfusion of 1000 c.c. of blood was given before and during the operation. An afebrile convalescence ensued and the patient was discharged on the twenty-second day.

The second patient was thirty-eight years old, para ii, admitted to the Brooklyn Hospital May 1, 1928, in good health and not in labor. The expected date of confinement was five days later.

*Previous History:* She was first delivered in 1924 at the Long Island College Hospital by craniotomy, at which time she had an intra- and postpartum fever. She was delivered there a second time in 1926 by an elective cesarean section, classified by the operator as a "low classical" for toxemia; she had a slight febrile convalescence. After her admission to the Brooklyn Hospital, an elective cesarean section was scheduled for May 5 at 8 A.M. However, at four o'clock that morning, the patient was awakened with a severe abdominal pain, and symptoms of shock rapidly developed. An immediate operation was performed. The abdominal cavity was filled with blood and the uterus showed a rupture 1" long by  $\frac{3}{4}$ " wide at the top of the former uterine incision. Underneath this was the placenta. The incision was extended upward and a dead fetus, weighing eight and a quarter pounds, was extracted. The edges of the rupture were closed with interrupted chromic gut sutures after first freshening them by removing a bridge of uterine tissue. Histologic

\*Presented at a meeting of the Brooklyn Gynecological Society December 2, 1932.

examination of the latter showed a marked hypertrophy in the size of the muscle cells and distention of the vascular channels. A 700 c.c. blood transfusion was given before and during the operation. Except for fever lasting only the first forty-eight hours, a good postoperative convalescence ensued and she was discharged sixteen days later.

The third patient was a twenty-six-year-old para i who was admitted on Sept. 9, 1932, to the Brooklyn Hospital, labor having begun four hours previously at home. Her expected date of confinement was Sept. 20. In 1927, a classical cesarean section had been performed at the Plaza Hospital in Manhattan, after a three-day labor, and a living child was obtained. An infection of the abdominal wound necessitated a month's stay in the hospital. When I first saw the patient, the pains present on admission had entirely subsided; she did not appear to be ill and had a normal pulse rate and a blood pressure of 116/70. The abdominal examination showed a full-term pregnancy; the previous cesarean scar was irregular and above the umbilicus; there was a soft bulging protrusion which resembled an umbilical hernia about eight centimeters in diameter, which fluctuated and had a flat note on percussion. Surrounding this protrusion, the separated tender edges of the old uterine wound were felt. A diagnosis of ruptured uterus with membranes bulging through the old wound was made, and an immediate operation was performed. In the uterus, there was a rupture 8 cm. long, the entire length of the previous incision. Through this opening ballooned the intact amnion. There was neither free blood in the abdominal cavity nor bleeding from the edges of the rupture. The sac was ruptured and a living full-term baby, weighing eight pounds, two and a half ounces, was extracted. The placenta was attached to the posterior wall. The edges of the wound were freshened and sutured with interrupted chromic catgut. An infusion of 600 c.c. of saline solution was given; blood transfusion was not necessary. A good convalescence without fever ensued, the patient being discharged on the nineteenth day.

30 PIERREPONT STREET.

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## RUPTURE OF UTERINE SCAR AND URINARY BLADDER FOLLOWING CESAREAN SECTION

IRA WILENS, M.D., NEW YORK, N. Y.

MRS. B. C., adult, white, twenty-nine years old, was admitted to the Beth David Hospital on April 7, 1932, with the following history: Patient had a classical cesarean section performed on June 9, 1926 for eclampsia and a living baby of three pounds was delivered. Postoperative course was uneventful.

Last menstrual period July, 1931, expected date of confinement latter part of April, 1932. On April 7, 1932 about 3:00 A.M. patient experienced mild pains in lower abdomen. Fetal movements were felt. At 6:00 A.M. the pains became very severe, frequent, tearing in character, and located in the right lower quadrant. Pains continued so for three hours. Patient was seen for the first time by me at 8:00 A.M. Physical examination revealed a patient acutely ill, restless, with slight pallor, and complaining of severe abdominal cramps. Temperature was normal and pulse rate 96. Abdominal examination revealed an irregular hard mass in the right iliac fossa, tender to touch. There was an ill-defined soft globular mass extending to within three fingers of the ensiform process. No uterine bruit or fetal heart was heard. There was slight vaginal bleeding, estimated amount about 2 ounces. Rectal examination revealed no presenting part. The pelvis was entirely free. At this

time a diagnosis of an impending uterine rupture was made and the patient brought to the hospital at once. After the patient reached the hospital (at 10:00 A.M.) she presented an entirely different clinical appearance. She appeared very comfortable, pulse was slow and of good volume. There were no pains and no bleeding. The patient's condition remained unchanged until 6:00 P.M. when she complained of slight pressure in the rectum, and sharp pains in the lower abdomen. Patient was catheterized twice before the operation and in each case a few drops of bloody fluid were obtained.

A preoperative diagnosis was made of rupture of the uterus and bladder.

*Operation.*—A right paramedian incision was made. About 350 c.c. of free blood was found in the peritoneal cavity and the uterus was well contracted lying in the left iliac fossa. Peritoneum of the lower one-half of the anterior abdominal wall (site of old operation) was hemorrhagic. Fetus within intact gestation sac was found free in the general peritoneal cavity. Amniotic sac was punctured, and the fetus was delivered by breech. Membranes and placenta (which lay under the liver) were removed manually. Tenaculum forceps was placed on the fundus of the uterus and the uterus was delivered into the wound. There was a large rent found about 6 by 15 cm. extending from the intertubal line, vertically downward in the mid-line on the anterior surface of the uterus, including the cervix; marked contusion and subperitoneal hemorrhage of the torn vesicouterine fold. On exposure of the vesicouterine fold of the peritoneum the entire fundus of the bladder was found torn off, presenting an opening about 7 cm. in diameter. A supravaginal hysterectomy was done in the usual manner, the cervix repaired with interrupted chromic sutures. The lacerated bladder was closed with fine chromic sutures, inverting mucosa, followed by two additional rows of sutures, the last row for peritonealization. The cervical stump was completely peritonealized and round ligaments and tubes were brought into stump: 5 Penrose drains were placed in anterior pelvic cavity. Abdomen was closed in layers. Indwelling catheter was placed in bladder and about 2 ounces of bloody urine was obtained; 750 c.c. of saline by hyperdermoeclysis was given on the table. Patient left the operating room in fair condition.

Postoperative convalescence was unusually smooth. On the twelfth postoperative day a small amount of urine leaked through the lower angle of the wound. This fistula closed in about one week. Patient was discharged on the twenty-fourth day. She was perfectly well when seen several weeks later for follow-up examination and had no bladder symptoms of any kind.

In reviewing the clinical course of this case, the mechanism of rupture of the scar and expulsion of the fetus, may be explained as follows: The mild pains at the onset were caused by stretching and beginning rupture of the scar. The severe abdominal pains which lasted for three hours were simply uterine contractions (labor pains) which forced the fetus in its intact sac through the rent in the uterus. During the delivery of the fetus because of adhesions present, the bladder was lacerated. The cessation of abdominal pains (labor pains) and the fairly comfortable appearance of the patient may be compared to the appearance of any post-parturient after the fetus has been expelled and the uterus has ceased to contract.

## TERATOCORMUS, CYLLOSOMA\*

T. M. BOULWARE, M.D., AND C. B. FLINN, M.D., BIRMINGHAM, ALA.

*(From the Department of Obstetrics, Hillman Hospital)*

FETAL anomalies and monstrosities crop up every now and then in any large series of obstetric cases. Because of the very unusual clinical features and apparently quite rare anatomic findings, the following fetal abnormality was deemed worthy of report.

CASE 77811.—A white primipara, aged eighteen, menstruated last Feb. 28, 1932. She later visited the prenatal clinic of the University Free Dispensary where her physical examination was reported negative except for a moderate thyroid enlargement. The pelvic measurements were found to be ample and the Wassermann reaction was negative in all antigens. Fetal heart tones were heard and fetal movements observed by the examining physician. About 4 A.M., Sept. 30, 1932, patient awoke to find a moderate amount of watery discharge on her nightclothes and then felt something coming down into vagina. There were no abdominal pains at this time. She was admitted on the Obstetrical Service of the Hillman Hospital at 8:30 A.M. at which time there was visible a complete prolapse of several inches of

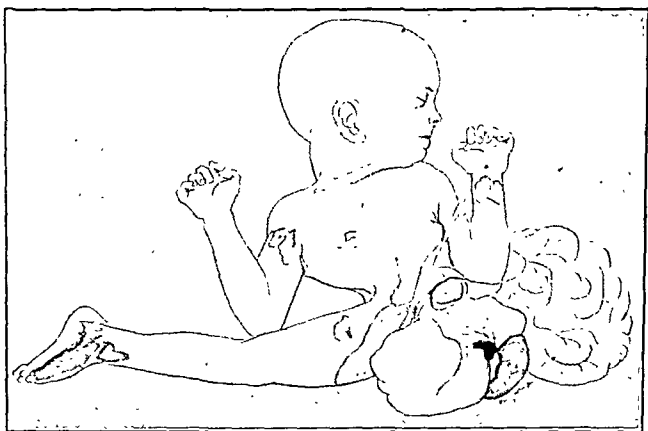


Fig. 1.—Drawing of the monstrosity showing the extensive visceral prolapse.

fetal gastrointestinal tract. A small nubbin of appendix could be identified and the prolapsed coils had the discoloration of a strangulated hernia. The cervix was scant two fingers dilated, canal not obliterated, and neither fetal heart tones nor fetal movements could be detected. Uterine contractions began soon after hospital admission. A diagnosis of either a fetal monstrosity or an enormous congenital hernia was made and the patient allowed to go into labor. Intrauterine death of the fetus appeared obvious. Contractions continued at intervals throughout the day with a gradual increase in the amount of prolapsed tissues. These were wrapped in a gauze bag, frequently saturated with antiseptic solution, and held away from the perineum by means of adhesive strips. Spontaneous breech delivery of the stillborn monster occurred at 11 P.M. Placental expulsion at once followed delivery of the fetus and at no time was there any appreciable escape of amniotic fluid. The mother's postpartum course was afebrile and uneventful.

\*Presented before Jefferson County Medical Society, Birmingham, Ala., October 24, 1932.

*Gross Description.*—The fetal head measured 31.5 cm. in greatest circumference and both upper extremities appeared well developed. The right lower extremity was lying at an angle of 45 degrees with the trunk and the lower leg strongly flexed. The left lower extremity and most of the anterior abdominal wall were absent. The line of failure extended upward from the genital area to the costal margin, thence transversely down around the body to the tip of the coccyx. There was a string of attachment between the margins of the body wall. On the ventral side this was continuous with the membranes of a placenta. The abdominal contents depended from the upper and posterior wall of the remaining body cavity. On the left side the finger could be passed upward into the thoracic cavity. The liver was lying across the upper ventral portion of the visceral mass. The spleen was recognizable on the left side and near it was a small stomach. A kidney was present over the sacral region. The intestines formed a tangled mass depending below the other viscera.

*Comment.*—Search of the obstetric literature and texts, modern and old, revealed that the term "cylosoma" fitted this monster. The term, derived from two Greek words, literally means "hollow body." Such a monster would belong to the teratocormus or trunk abnormality group. Apparently a large portion of the entire fetal gastrointestinal tract was lying free in the amniotic sac and prolapsed following a premature rupture of the amnion. From the appearance of the fetal tissues, intrauterine death must have occurred about the time of the prolapse. No definite developmental explanation for the monstrosity is offered. We believe that a relative oligohydramnios was probably present in the case but its importance as the primary factor is somewhat doubtful.

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Hilpert, F.: Stenosis of the Large Intestines as the Result of Disease of the Female Genitalia. *Monatschr. f. Geburtsh. u. Gynäk.* 91: 279, 1932.

Pelvic infections which are associated with large exudates have a decided influence upon the rectum and sigmoid. By means of x-ray pictures it is possible to detect the origin of the results of inflammatory changes. Likewise it is possible to tell the difference between tumors of the bowel and inflammatory tumors of the adnexa outside of the bowel. Tumors of the bowel show a narrowing of the lumen on x-ray plates, whereas inflammatory lesions produce a stretching and elongation of the involved portion of the intestines. The absence of any defect in the wall of the bowel also speaks against a malignant tumor of the intestines. Likewise in cases of stenosis due to a bowel tumor, barium is blocked whereas in cases of obstruction due to overlying inflammatory tumors, the barium passes through the bowel. The intestinal mucosa remains unchanged.

J. P. GREENHILL.

Guthmann, and May.: The Question of Intrauterine Renal Function. *Monatschr. f. Geburtsh. u. Gynäk.* 91: 306, 1932.

The urea and uric acid in the maternal blood and in the liquor amnii were studied by Guthmann and May. They found that these products increased in the liquor amnii with advance in pregnancy. On the other hand, these substances remained constant within physiologic limits throughout gestation in the mother's blood. Hence the kidneys of the fetus function and secrete urine at least during the second half of pregnancy.

J. P. GREENHILL.



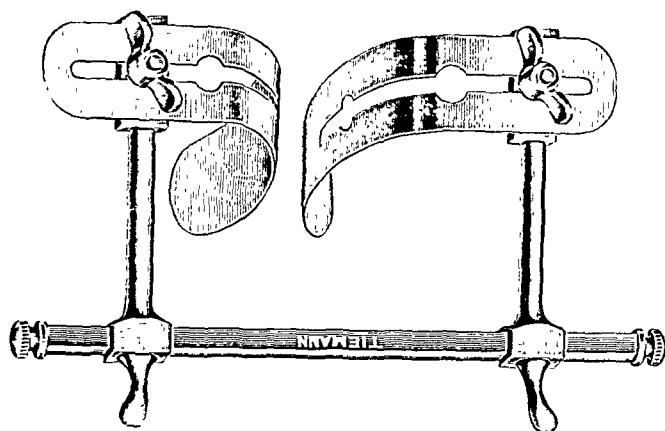
## A VAGINAL RETRACTOR FOR OPERATIONS ON THE CERVIX

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(*Adjunct Assisting Visiting Gynecologist, Columbus Hospital*)

THIS vaginal retractor was devised to obtain a better exposure of the cervix for operative treatment. The chief difficulties encountered by the surgeon in the operating room are faulty exposure, the necessity of two assistants to hold retractors, and undue tension exerted on the vulsellum, applied to the cervix. The latter is often attended by an undue stretching of the uterosacral ligaments, and, in some instances, it may even cause a prolapse of the uterus.

In the performance of the common operations on the cervix, exposure of the latter is usually obtained by the insertion of a weighted vaginal speculum into the



vagina. Right-angled retractors, held by assistants, are placed to roll out the lateral vaginal walls. Under these circumstances the operating field is usually small, and consequently it becomes necessary, in most cases, to pull the cervix by tenaculum down to the vulvar opening where it can be operated upon with greater facility.

Our instrument is a self-retaining retractor, consisting of two pliable blades which are attached to the arms by set screws. The blades can be shaped or bent to conform with the individual and anatomical configuration of the lateral vaginal walls, and they can also be lengthened or shortened as desired by fixing the set screws. The lateral vaginal walls and edges are thus held apart without assistance, giving an excellent view of the cervix and a more roomy operating field in which to work. This instrument can be employed with or without the weighted vaginal speculum.

The illustration shows the complete instrument, assembled with the pliable retractor blades in position.

We wish to acknowledge the help of Mr. F. W. Schaefer of George Tiemann and Company who made the retractor and offered many valuable suggestions.

180 EAST ONE HUNDRED ELEVENTH STREET.

# Department of Maternal Welfare

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CONDUCTED BY FRED L. ADAIR, M.D., CHICAGO, ILL.

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## A STUDY OF MATERNAL MORTALITY IN 15 STATES

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(From the Division of Maternal and Child Health, U. S. Children's Bureau)

OBVIOUSLY studies of maternal mortality based on death certificates are insufficiently detailed and studies based on selected series of cases insufficiently general to give a picture of conditions surrounding the deaths from puerperal causes in the United States as a whole. Accordingly a plan for a study of maternal mortality by means of interviews with physicians attending all the deaths from puerperal causes in a State in a set period of time was presented by the Chairman of the Children's Bureau Obstetric Advisory Committee<sup>1</sup> to the 1926 Conference of State Directors in charge of the administration of the Maternity and Infancy Act. Such a study was made of all the deaths in 1927 and 1928 in 13 States—Alabama, Kentucky, Maryland, Michigan, Minnesota, Nebraska, New Hampshire, North Dakota, Oregon, Rhode Island, Washington, Wisconsin, and Virginia—and of the deaths in 1928 in 2 others, California and Oklahoma. The study was made in these States at the formal request of the State Medical Societies; the interviews were made by physicians on staffs of the State Boards of Health or of the United States Children's Bureau, and all statistical work was done in the Children's Bureau. Close contact between all interviewers was maintained to keep interpretation uniform. The writing of the report has been done under the guidance of the members of the Obstetric Advisory Committee and they have supplied the comments and recommendations for the report.<sup>2</sup>

The population of the States included conformed fairly closely to the population of the United States according to the Census of 1920. The maternal mortality rate was 64 per 10,000 live births in the States included as compared with 67 in the Birth Registration area for the two years.

In these States and years 7,537 deaths were assigned by the Division of Vital Statistics of the Bureau of the Census to the group "the puerperal state" in accordance with the *International List of Causes of Death*, 1920 revision and the *Manual of Joint Causes of Death*. These deaths were taken as the basis of the study. A copy of each death certificate, and when possible the birth certificate of the infant, was obtained from the State bureaus of vital statistics each month and the attending physician or midwife was visited as soon as possible thereafter. In hospital cases the hospital also was visited. The physicians interviewed were most cooperative in giving time and information for the study. While relatively few had kept case histories, their memory of the case was usually vivid. But in many

<sup>1</sup>Robert L. De Normandie, Chairman; Fred L. Adair, Rudolph W. Holmes, Frank W. Lynch, James R. McCord, C. Jeff Miller, Otto H. Schwartz, Alice N. Pickett.

<sup>2</sup>The study is reported in:

Maternal Deaths: a brief report of a study made in 15 States, U. S. Children's Bureau Publication No. 221. Washington, 1933.

Maternal Mortality in 15 States. (In press.) This is the detailed report of the findings, with base tables and with fuller discussion.

cases either the opportunity or the facilities for a thorough study of the case had been lacking. In relatively few cases had any laboratory work other than urinalysis or blood pressure examination been done. Only 571 autopsies had been performed, and many of these were in coroner's cases or in other cases of doubtful diagnosis in which the autopsy had been performed for legal rather than for scientific reasons. In a few cases, particularly when no physician had been in attendance, very little information except that given on the birth and death certificates could be obtained.

A number of changes in classification were found necessary as a result of the interviews. Of the 7,537 deaths studied, 157 were found to be nonpuerperal in the meaning of the international classification, and were accordingly excluded. Sixty-eight of these women had not been recently pregnant; the other deaths would have been assigned to such causes as chronic nephritis or cardiac disease, tuberculosis, or others taking precedence over the puerperal cause, if full information had been given on the death certificate. The analysis was based on the 7,380 deaths found after interview to be puerperal in the meaning of the international classification. However, as deaths actually puerperal but assigned to some other cause on account of defective certification, were not among the 7,537 studied, the total of 7,380 deaths and the mortality rates given in the report as based on that number, are probably too low. The maternal mortality rate for the States and years included was 64.1 if based on the 7,537 deaths; 62.7 if based on the 7,380.

*Causes of Death.*—After the interviews the 7,380 deaths attributed to the various puerperal causes were divided as follows: accidents of pregnancy 719 (10 per cent); puerperal hemorrhage 791 (11 per cent); other accidents of labor 652 (9 per cent); puerperal septicemia 2,948 (40 per cent); puerperal phlegmasia alba dolens, embolus, sudden death 344 (5 per cent); puerperal albuminuria and convulsions 1,900 (26 per cent); following childbirth not otherwise defined 23, and puerperal diseases of the breast 3. The findings resulting from special analyses of the deaths in these cause groups, which are discussed in detail in the report of the study, cannot be given here for lack of space.

*Race and Nativity.*—The 1,308 deaths of colored women made up 18 per cent of the 7,380 included in the study. The maternal mortality rate for colored women (108.5 per 10,000 live births) was nearly twice as high as that for white women (57.5 per 10,000 live births). The rates were higher among colored women for every main cause of death except puerperal phlegmasia alba dolens, embolus, sudden death; the greatest difference was in puerperal albuminuria and convulsions, which caused 33.8 deaths per 10,000 live births among colored and 14.1 among white women.

Fourteen per cent of the white women, the place of whose nativity was reported, were foreign born. The maternal mortality rate among these women was 65 as compared with 55 for the native born white women.

*Deaths in Urban and Rural Areas.*—Under urban areas are included all cities with 10,000 or more population, as shown in the 1920 census. The maternal mortality rate was higher in urban districts (75 per 10,000 live births) than in rural districts (55 per 10,000 live births). The rates for the groups "accidents of pregnancy," "other accidents of labor," "puerperal septicemia," "puerperal phlegmasia alba dolens" were significantly higher in urban than in rural areas. There was no significant difference in the other main causes of death. The greatest difference was in the mortality rates from puerperal septicemia (urban 33.5, rural 19.6) and the difference in this rate was largely due to the higher rates from septic abortion in the cities than in the rural areas. The factor of residence could not be evaluated as it was impossible to obtain data on the residence of all the mothers of live-born children. However, the urban rate was undoubtedly raised by the deaths in urban hospitals of nonresidents who had been delivered in rural areas.

*Medical Attention.*—Nine per cent of all the deaths were of women who had had

no medical care whatever, or had care only when dying. Lack of medical attention was not always associated with inaccessibility of the physician, but it was more frequent when there was no physician living in the vicinity. Yet even in cases of women having a physician nearby, 7 per cent of the number for whom medical attention was reported had no care or care only when dying. Poor roads and slow transportation were apparently greater factors in inaccessibility than mere distance.

*Hospitalization.*—Of the 7,380 women included in the study there was a report on hospitalization for all but 14. More than half—4,213 women—had been hospitalized at some time during their final illness. The deaths of 4,066 of the 4,213 occurred in hospitals, but the deliveries or abortions of only 2,629 had occurred in hospitals. Of the 4,066 women whose deaths occurred in hospitals 2,501 had reached the last trimester of pregnancy; 1,558 died before reaching the last trimester; for 7 there was no report on period of gestation. Only 1,893 of the 2,501 women who were known to have reached the last trimester were actually delivered in the hospital for delivery and only 845 of the 1,893 were known to have had planned hospitalization. Hospitalization was less frequent and more of it was of an emergency nature among the colored women than among the white women.

*Period of Gestation.*—Thirty-two per cent of the 7,346 women concerning whom period of gestation was reported died before reaching the last trimester of pregnancy. Of the 2,381 deaths in the first two trimesters, 59 per cent were due to puerperal septicemia, 24 per cent to accidents of pregnancy, 14 per cent to puerperal albuminuria and convulsions, and 2 per cent to puerperal phlegmasia alba dolens, embolus, sudden death. Of the 4,965 deaths in the last trimester, 31 per cent were due to puerperal septicemia, another 31 per cent to puerperal albuminuria and convulsions, 16 per cent to puerperal hemorrhage, 13 per cent to other accidents of labor, 3 per cent to accidents of pregnancy, and 6 per cent to puerperal phlegmasia alba dolens, embolus, sudden death.

*Abortions.*—Abortion, as used in this study, may be defined as the termination of a previable uterine pregnancy. Deaths certified as due to criminal abortion are assigned to homicide in the International List of Causes of Death, and therefore are not included in "maternal mortality." However, abortions not certified as criminal were not excluded from this study, even if the attending physician knew or was convinced that they were criminal.

Of the 2,381 deaths before the seventh month of gestation, 1,825 followed abortion, 554 did not follow abortion, and for 2 this was not reported. Of the 1,825 deaths following abortion 1,324 were attributed to puerperal septicemia, 290 to accidents of pregnancy, 163 to puerperal albuminuria and convulsions, 44 to puerperal phlegmasia alba dolens, embolus, and sudden death, and 4 to puerperal hemorrhage. The 1,324 deaths from sepsis following abortion constituted 45 per cent of the total number of deaths from puerperal septicemia.

The type of abortion was reported in 1,588 of these 1,825 cases. Of these, 794 (50 per cent) were induced (other than therapeutic) 589 (37 per cent) were spontaneous, and 205 (13 per cent) were therapeutic.

A report concerning operations was obtained for 1,777 of the 1,825 cases in 992 (56 per cent), of which there had been some operation. The most frequent operation was curettage. Of the women who had spontaneous abortions 212 (36 per cent), and of those who had induced abortions 289 (37 per cent) had been curetted. Evidently many physicians did not consider fever a contraindication for curettage, for 448 (69 per cent) of the 652 women who had abortions and were curetted were reported to have had fever before the curettage. Puerperal sepsis caused 94 per cent of the deaths of these 448 women, as compared with 50 per cent of the deaths of women who were afebrile before the curettage and 68 per cent of the deaths of the women who had no curettage.

Married women made up 90 per cent of the women whose deaths followed abortion, but abortion was a more frequent cause of death among unmarried than among married mothers, for abortion preceded the deaths of about one-fifth of the married mothers and of more than one-third of the 509 unmarried mothers included in the study.

The mortality rate for deaths following abortion was higher among the colored than among the white women and among urban women than among rural women. The difference between urban and rural groups was most marked in induced abortions, for which the mortality rate was 11 per 10,000 live births in urban districts as compared with 4 in rural districts. The proportion of maternal deaths that followed abortion in the various states ranged from 18 to 37 per cent. The variation was greatest for induced abortions, which ranged from 3 to 23 per cent of all maternal deaths.

*Live Births and Stillbirths.*—Only 3,091 (43 per cent) of the 7,226 women for whom the type of issue was reported gave birth to living children. Twenty per cent were delivered of stillborn children of more than seven months' gestation. Twenty-nine per cent had nonviable issue, and 8 per cent died undelivered. In this study the term "stillbirth" is used only of dead-born issue of seven or more months' gestation.

*Parity.*—Primiparae made up one-third and multiparae two-thirds of the 6,854 women in the study for whom the number of pregnancies was reported.

*Illegitimacy.*—The deaths of 509 unmarried women were included in the study. Omitting from the calculations California, where data on legitimacy are not given in the birth certificate, the maternal mortality rate for the unmarried women was 143 per 10,000 illegitimate live births, while the rate for the married women was 60 per 10,000 legitimate live births. The rates were higher for the unmarried women in both the white and colored groups. Puerperal septicemia caused 51 per cent of the deaths of unmarried and 39 per cent of the deaths of married women, puerperal albuminuria and convulsions 32 per cent of the deaths of unmarried and 25 per cent of the deaths of married women. The deaths of 186 unmarried women followed abortion; 129 of them were reported to have been induced abortions.

#### MATERNAL CARE

In this study attention was confined largely to the medical aspects of maternal care.

All the cases in the present study were eventually abnormal, for all these women died. The details of the care given them were frequently determined by that abnormality. Of the 7,380 women whose deaths are included in this study only 616 were known to have had no complication of pregnancy and no intercurrent disease. Only 199 of the 616 were reported to have had normal spontaneous deliveries in the last trimester, a normal third stage of labor and no postpartum hemorrhage. The deaths of 100 of these 199 women were due to puerperal sepsis, 55 to puerperal phlegmasia alba dolens, embolus, sudden death, 23 to other accidents of labor, 15 to puerperal albuminuria and convulsions, and the other 6 to other puerperal causes. It should be borne in mind that a large number of women who had no prenatal care or about whose care during pregnancy nothing was known were for obvious reasons not included in the group just discussed.

*Prenatal Care.*—In the study of prenatal care the 1,154 cases in which either there had been an induced abortion or pregnancy had terminated before the third month were for obvious reasons excluded. In 590 cases no report on prenatal care could be obtained. The group for which prenatal care was studied consists, therefore, of 5,636 women.

Of these 5,636 women 3,025 (54 per cent) had no prenatal care whatever.

The grading of the prenatal care received was based on examinations only, not on treatment; and on the period of pregnancy at which it began rather than on its duration as it might be limited by the early termination of pregnancy. Thirteen per cent of the 5,636 (725 women) had "good" care although not up to the highest standards, which began not later than the fifth month. Forty-two of the 725 apparently had had adequate care as prescribed in Standards of Prenatal Care.<sup>1</sup> The term "indifferent" may be used to describe the prenatal care received by 499 women (9 per cent). This began not later than the seventh month. "Poor" prenatal care was received by 1,337 women (24 per cent). Fifty women (1 per cent) had some prenatal care, but sufficient information to grade it could not be obtained.

Only 16 per cent of the 2,611 women who had some prenatal care were known to have had a Wassermann test and 44 per cent to have had pelvic measurements (including 20 per cent who probably had external measurements only). Apparently 79 per cent had at least one blood-pressure examination.

The type of prenatal care that can be given depends upon the promptness with which the pregnant woman presents herself to a physician. Of the 2,611 women who had some prenatal care, 1,478 first visited the physician in or before the fifth month, so they were seen early enough to be given "good" care, if the other requirements had been met. Forty-nine per cent of these women received "good" care, 16 per cent had "indifferent" care, and 34 per cent had "poor" care; the care received by 9 women could not be graded.

Fifty-five per cent of the women who died before they reached the last trimester died too early in pregnancy to have been expected to have prenatal care, or had induced abortions, or else information concerning their care was not obtained. But of the remaining 1,064 women, 17 per cent had "good" care, 3 per cent had "indifferent" care, 14 per cent had poor care, the care received by 1 per cent was ungraded and 66 per cent had no care.

Of the 4,570 women who died after reaching the last trimester and for whom a report was obtained concerning prenatal care, 12 per cent had "good" care, 10 per cent "indifferent" care, 26 per cent "poor" care, 1 per cent was ungraded, and 51 per cent had no care. Twenty-four per cent of those who died following "good" care, and 34 per cent of those who had had no care, died of puerperal albuminuria and convulsions.

Considering only the women for whom a report as to prenatal care is available and applicable 14 per cent of the primigravidae and 22 per cent of those in their second pregnancy had good care, while 46 per cent of the former and 39 per cent of the latter had no prenatal care whatsoever. After the second pregnancy the amount of good prenatal care decreased with the number of pregnancies, and the percentage of those who had had no prenatal care rose with the number of pregnancies.

Among the 4,843 cases of women who had reached the last trimester in which there was a report on the character of issue, 70 per cent were live births for the mothers who had had "good" or "indifferent" prenatal care, 63 per cent for those who had had "poor" care, and 58 per cent for those who had had no prenatal care.

Prenatal care was much more frequent among the white than among the colored women, and in both groups prenatal care was more frequent in the urban districts than in the rural districts. The quality and amount of prenatal care given varied greatly in the different States included in the study. In general, the States in which

<sup>1</sup>Standards of Prenatal Care; an outline for the use of physicians, U. S. Children's Bureau Publication No. 133. Washington, 1925.

more of the women who died had had "good" care had lower mortality rates from puerperal albuminuria and convulsions.

*Delivery Care.*—The actual evaluation of the factors determining the adequacy of care at delivery is obviously difficult. In this study no attempt was made to grade the types of delivery care given, but the simplest and most objective of the factors involved were studied separately.

*Place of Delivery.*—Of the 4,965 women who reached the last trimester of pregnancy, 1,971 were in hospitals for delivery or at the time of death if they died undelivered. The hospitalization of 899 of these women was planned, but for 1,018 it was an emergency, for 54 there was no report. For 4 the place of delivery was not reported, and the remaining 2,990 were delivered or died undelivered outside of hospitals. The hospitalization of white women was much more frequent than of colored women. Maternal mortality rates for hospitals and for homes cannot be given because data regarding the total number of deliveries in hospital and in homes are not available; but even if there were such data, the large and varying proportions of complicated cases among those delivered in hospitals invalidate comparisons.

*Attendant at Confinement.*—Information on the attendant at the delivery or the death if the patient died undelivered was obtained for 4,903 of the 4,965 women who died after reaching the last trimester. Of these 4,903, 4,065 (83 per cent) were attended exclusively by physicians, internes, or medical students. Midwives attended 550 women (11 per cent) including 193 for whom physicians were called in before the delivery was completed. Nonmedical attendants such as relatives attended 172 women, and 116 women were said to have been unattended.

Practically all the midwives who cared for these women were untrained. Of the 550 women attended at confinement by midwives 462 died in Alabama, Kentucky, Maryland, and Virginia, and these 4 were the only States of the 15 in the study in which the number of deaths of women attended by midwives constituted 10 per cent or more of the total number of deaths of mothers who had reached the last trimester. In Alabama, Maryland, and Virginia the proportion of midwife-attended confinements among the women who died was very slightly smaller than the proportion of midwife-reported births among the total live births of the State.

*Technic of the Physician.*—The technic of the principal physician at confinement was described by him in 3,619 of the 4,305 cases in which a physician attended women in the last trimester. In 48 per cent an aseptic technic was said to have been used. This included shaving, scrubbing, sterile drapes, instruments, and rubber gloves, and adequate assistance at delivery. In 14 per cent the technic was classed as attempted aseptic; in 30 per cent, as clean but not sterile, and in 7 per cent as dirty. In many cases the principal physician whose technic was assigned to one of the first three classes was preceded by some one whose technic was less careful.

The principal physician made vaginal examinations in 2,765 cases and made no vaginal examinations in 1,089 cases; in 451 cases there was no report on this matter; and in 660 cases no physician was in attendance. The principal physician had made one vaginal examination in 871 cases, two in 565 cases, and three or more in 771 cases; in 558 cases the number was not given. Of the 2,765 cases in which the principal physician made vaginal examinations, rubber gloves were reported used in 2,188 cases, not used in 484 cases, and there was no report on their use in 93 cases. Rectal examinations were reported as having been made by the principal physician in 778 cases; in 326 of these he made one or more vaginal examinations also.

There was a report on the use of pituitrin in 3,718 of the 4,305 last-trimester cases with a physician in attendance. Pituitrin was said to have been used before the delivery of the child in 711 cases, after the delivery of the child only in 1,004 cases, and at an unreported stage of labor in 24 cases. In 1,979 cases pituitrin was

said not to have been used. In the group of cases in which pituitrin had been used before the delivery of the child larger proportions of the deaths were from puerperal septicemia and puerperal hemorrhage and a smaller proportion was from puerperal albuminuria and convulsions than in the group in which no pituitrin had been used.

### OPERATIONS

More than half of the women whose deaths were studied had some operative procedure. Of the 7,234 women concerning whom there was a report on this point, 3,370 (47 per cent) had had no operation, while 2,649 (37 per cent) had had an operation directed toward delivery and 1,131 (16 per cent) had had some operation other than for delivery. By an operative delivery is meant an operation for the purpose of delivering the fetus or for the immediate removal of the placenta. Attempts at these operations, as well as completed operations, are included. Other operations were secondary, usually on account of sequelae of the delivery.

*Operations in the First Two Trimesters.*—The 205 therapeutic abortions and the 195 laparotomies for ectopic gestation made up nearly all the operations for delivery performed in the first two trimesters. Various other operations were performed in conjunction with or on account of sequelae of some of the operations for ectopic gestation, but in only 26 cases was this other operation a blood transfusion. Of the 205 women who had had therapeutic abortions, 38 had some other operation besides—a second curettage, a blood transfusion, or packing of the uterus because of hemorrhage. Fourteen of the 38 women had laparotomies subsequent to the therapeutic abortion.

At least one curettage had been done on 585 women who had had a spontaneous abortion or an induced abortion other than therapeutic. Fifty-three women who died before the third trimester had had blood transfusions as their only operation. Another group (82) who had had no operation for delivery, had laparotomies performed for various complications.

*Operations in the Last Trimester.*—*Operations for Delivery:* Of the 4,965 women who reached the last trimester of pregnancy, 2,225 (45 per cent) were known to have had an operative delivery, or an attempt at operative delivery.

*Forceps:* Forceps operations were performed 718 times. (In addition, there were 98 cases of forceps and version combined; usually when forceps failed the delivery was completed by version.) In 150 of the 718 cases the application of forceps followed induction of labor or artificial dilatation of the cervix. In 24 cases the use of forceps was followed by manual removal of the placenta. In 12 cases all three procedures were used. In 14 cases forceps was used in combination with some other operation. Of the total of 162 cases in which the use of forceps followed induction of labor or artificial dilatation of the cervix, 106 were of women who were not in labor when the artificial dilatation of the cervix was begun.

*Version:* Version was the principal obstetric operation in 618 cases, including the 98 cases in which forceps was used in conjunction with version, or 520 cases in addition to the 98. In 224 of these 520 cases version followed artificial dilatation of the cervix: in 26 cases it was followed by manual removal of the placenta, in 48 cases it was accompanied by both dilatation of the cervix and manual removal of the placenta, and in 4 cases it was accompanied by some other operation or a combination of operations. Therefore in a total of 272 cases version was preceded by dilatation of the cervix; 84 of these were cases in which labor had begun spontaneously. In 172 cases the dilatation was done to induce labor as well as to facilitate delivery. Six of these women died undelivered after attempts at version had failed.



*Cesarean Section:* Cesarean section preceded the deaths of 531 (11 per cent) of the 4,832 women who died after reaching the last trimester, 24 per cent of all who had operations for delivery in this period.

The causes of the deaths following cesarean section as given on interview by the attendant physicians were: Accidents of pregnancy, 3; puerperal hemorrhage, 42; other accidents of labor, 146 (including cesarean section, 136); puerperal septicemia, 143; puerperal albuminuria and convulsions, 202; and embolus and sudden death, 1.

The indications for cesarean section were varied and combinations of indications were frequent. The principal indications given were: Some form of toxemia, 239 cases, including eclampsia in 165; absolute or relative disproportion or long labor, 144; conditions associated with hemorrhage, 62; abnormal presentation, 33; previous cesarean sections, 17; some other indication, 42.

Eighty-two of the 537 cesarean sections were planned, 452 were emergency, and in 3 cases there was no report on this.

Cesarean section followed attempts at other forms of operative delivery in the cases of 62 women, 42 of whom were primiparas.

Ether was the most common anesthetic used. It was used alone in 275 of the 480 cases for which this information was obtained, in other cases in combination with some other anesthetic. Nitrous oxide oxygen anesthesia was used alone in 56 cases and with ether in 62 cases. Ethylene was used in 41 cases and chloroform in 14 cases. Local anesthesia was used in only 19 cases, in 5 of which it was supplemented by nitrous oxide or ether and in 1 case with sacral anesthesia. Spinal anesthesia was used in 8 cases.

The duration of labor was reported for 495 of the 531 women dying from cesarean section in the last trimester of pregnancy. Of the 250 who were not in labor, the cause of death in 11 per cent was puerperal septicemia. Of the 245 women in labor for whom the number of hours was reported, 38 were in labor less than six hours; 35, from six to twelve hours; 51, from twelve to twenty-four hours; 32, from twenty-four to thirty-six hours; and 89, more than thirty-six hours. With increase in the duration of labor, the percentage of deaths that were assigned to puerperal septicemia rose rapidly, from 29 per cent for those in labor less than twelve hours to 51 per cent for those in labor thirty-six hours or more.

Vaginal examinations by the operating physician preceded the cesarean section in 52 per cent of the cases in which this information was secured. Of the 231 women who had no vaginal examination by the operating physician, 20 per cent died of sepsis and 43 per cent of albuminuria and convulsions; but of the 254 women who had vaginal examinations, 34 per cent died of sepsis, and 30 per cent of albuminuria and convulsions.

*Other Operations for Delivery.*—The cervix was dilated manually, by bags or by other artificial means for 112 women, of whom 89 delivered spontaneously and 23 died undelivered. Four of the 89 women who delivered spontaneously after dilatation of the cervix also had a manual removal of the placenta. Manual removal of the placenta followed a spontaneous labor and delivery in 87 cases. Other operations included 65 breech extractions, 57 craniotomies and embryotomies, and 8 laparotomies for abdominal pregnancy. Twenty women had some other operation or other combination of operations, and 9 had some operation for delivery, but its type was not reported. For 133 women no report could be obtained as to whether or not there had been an operative delivery.

*Prenatal Care.*—Of the 1,879 women who died following operative termination of labor in the last trimester of pregnancy, and for whom there was a report as to prenatal care, 807 had no prenatal care; that is, 43 per cent of the operative deliveries were on women whom the physician had not seen before labor or before the acute emergency.

*Age and Parity.*—The frequency of versions increased, and frequency of forceps decreased, with the number of pregnancies. Cesarean sections preceded the deaths of 17 per cent of the primiparae, 12 per cent of the secundiparae, 8 per cent of the women who had had three to five pregnancies, and 5 per cent of those who had had six or more pregnancies, who died after reaching the last trimester.

The incidence of operations for delivery increased with age both for primiparae and for multiparae. Among primiparae there was a definite increase with age for cesarean sections; 33 per cent of the last-trimester deaths of primiparae of 30 years or older were preceded by cesarean section. Among multiparae there was a definite increase with age for forceps, version, and cesarean section.

*Incidence.*—The deaths of white women were more often preceded by operative deliveries than those of colored women, and the deaths were more often preceded by operative deliveries in the urban than in the rural districts. The proportion of maternal deaths that were preceded by operations for delivery in the last trimester ranged from 34 to 57 per cent in the States studied.

The percentages of maternal deaths that were preceded by cesarean section in the last trimester ranged from 2 to 24 per cent in the States studied, and in the 15 States the incidence was 17 per cent among the urban white, 16 per cent among the urban colored, 7 per cent among the rural white, and 4 per cent among the rural colored.

*Operations Other Than for Delivery.*—Some operation other than the actual delivery of the child or of the placenta was performed on 636 women who died after reaching the last trimester, of whom 301 also had an operative delivery. Most of these other operations were done for conditions resulting from the delivery. These operations included curettage, packing of uterus or cervix, blood transfusions, laparotomies for drainage of peritonitis and a smaller number of enterostomies, appendectomies and hysterectomies. Combinations of operations were frequent.

#### COMMENT

The following are excerpts from the *Comments on the Study by the Obstetric Advisory Committee* based on the findings as given in the complete report, and on the study of individual schedules:

In this study the International List of Causes of Death as applied in the *Manual of Joint Causes* in use by the United States Bureau of the Census has been used as the chief basis of classification. While this procedure was not entirely satisfactory from a medical point of view, the inherent disadvantages seemed counterbalanced by the fact that it provided a definite and understandable classification, and that its use would assist the comparison of the findings with those of other investigators.

Certain changes in classification resulted after the interviews. These alterations which were made necessary by various causes emphasize the dependence of the official statistics on the original death certificate and the apparent unavoidability of a small percentage of error. A relatively small number of cases were excluded as nonpuerperal. These cases are easily equaled or exceeded by those that were actually puerperal but that were classed in the vital statistics as nonpuerperal and so were not included in the study. Therefore, maternal mortality rates as given in this study are probably lower than the actual rates.

Autopsies were held in less than 8 per cent of the cases, and many of the autopsies were done by coroners. It is apparent that there was gross lack of scientific study of the puerperal deaths included in the study.

The exceedingly high death rate among colored mothers is especially challenging when considered in connection with the poor maternal care that was received by these colored women.

The differences between urban and rural rates cannot be fully explained by this study, as complete information on residence is not available. It is apparent, however, that two of the factors contributing to the higher urban rates are the larger proportion of abortions in the urban than in the rural communities and the deaths in urban hospitals of women who were delivered in rural areas. The exact value of the second factor cannot be determined from this study for reasons given in the report.

Nine per cent of the women had no medical attention whatever or else had attention only when they were actually dying. Only part of this was due to physical inaccessibility. Inaccessibility due to distance and bad roads, however, was a serious problem in certain localities of the States studied. The part played by inaccessibility in the lack of *early*, as distinguished from *any*, medical attention was not measured; but the larger proportion of deaths from hemorrhage and the toxemias in the less accessible groups is suggestive, especially when considered in conjunction with the lack of prenatal care among women who died in the rural areas.

It is impossible to draw conclusions as to the relative safety of deliveries in hospitals and homes from a study of deaths alone. Data regarding the total number of deliveries in hospitals and homes were lacking. Many hospital deaths followed home deliveries, and many of the hospital deliveries were emergency cases. However, there were too many deaths of women who had planned hospital deliveries in the last trimester.

The figures relative to stillbirths and live births indicate strikingly the appalling loss of fetal life associated with maternal deaths; 37 per cent were either undelivered or previsible infants, 20 per cent of the viable fetuses were stillborn, and only 43 per cent are credited as being live births. The number of these infants who died or were damaged survivors, was not possible to determine from this investigation.

One-third of the deaths were of women who had not reached the last trimester of pregnancy. Duration of pregnancy is a most important consideration in the evaluation of any statistics on maternal mortality.

Illegitimacy contributes to maternal mortality, as 7 per cent of the deaths in this study were of unmarried women and the mortality rate is much higher for unmarried than for married mothers. There was a larger proportion of abortions among the unmarried, and the deaths from such preventable causes as sepsis and toxemia were relatively more numerous among the unmarried mothers. Social and economic factors doubtless play an important rôle in creating this mortality, and they should be adjusted to prevent this loss of life.

*Abortions.*—The fact that one-quarter of all the maternal deaths in this study followed some type of abortion is probably the most outstanding finding of the study.

The most frequent operation in the management of these abortions was curettage, usually with sharp instruments, which is a procedure definitely to be condemned.

This study shows very clearly the seriousness of the problem created by the great number of abortions that are induced each year. . . . Physicians must be made to appreciate the seriousness of curetting these potentially septic cases. The management of an abortion calls for the best medical care that can be given, and in many of the cases in this series it is obvious that such care was not given. The abortion problem cannot by any means be solved by the medical profession alone. It is a widespread sociologic and economic problem, which the medical profession must have help in solving. However, the physician has one great obligation, to teach the public the dangers entailed by abortion, whether spontaneous or induced.

*Maternal Care.*—It is discouraging to find that of the women on whom a report as to prenatal care could be obtained and who could reasonably have been expected to have such care, 54 per cent had had no prenatal examination by a physician.

In only 1 per cent was the care given up to the standard that it is the right of every pregnant patient to have and to demand.

For the deaths of the women who had had no prenatal examination the attending physician could hardly be held responsible, for he was not consulted until an emergency had arisen. Gross ignorance, carelessness, and sociologic and economic problems all had a share in this responsibility. However, in those cases in which the physician was consulted he was responsible for providing adequate maternal care; and in many of these cases physicians failed in their responsibility for half the women who did consult a physician had poor prenatal care.

Evidence for the value of prenatal care may be found in the fact that smaller proportions of the women who died after good prenatal care than of those who died after poor prenatal care died of puerperal albuminuria and convulsions. Further evidence may be found in the larger proportion of live births in those cases in which there had been good prenatal care; and in the fact that those States with more good prenatal care even among the women who died had lower death rates from albuminuria and convulsions.

Primiparas and the mothers of many children particularly need prenatal care, but a smaller proportion of these women received it.

Delivery care, though as important as prenatal care, was more difficult to evaluate in a study of this sort, but there are certain facts to be noted. For more than half of the women who died in hospitals, hospitalization was an emergency measure. Among the colored women emergency hospitalization was much more frequent than among the white women.

Figures given in the report would indicate that though the midwives played a part in the mortality they could not have been responsible for any large proportion of the deaths because they attended a relatively small percentage of the cases.

No study of the qualifications of the individual physicians or midwives was attempted. As it was known, however, that the majority of the midwives were ignorant "grannies," it may safely be assumed that these midwives did not use a satisfactory aseptic technic at delivery. In 48 per cent of the cases the physicians described their technic in such a way that it was classified as aseptic, but obviously there is no way of determining how good this technic was; it may have been described as better than it really was. The point to be noted is that the physicians themselves admitted it was unsatisfactory in more than 50 per cent of the cases. The frequency of vaginal examinations, oftentimes without gloves, is clear, and the relatively few rectal examinations must be noted.

Although the data on the use of pituitrin are incomplete its use is shown to be common and to be associated with serious accidents.

*Operations.*—The physicians who delivered these patients cannot be blamed in all cases for the results obtained, for in 43 per cent of these operative deliveries they had not seen the women before labor or before the acute emergency had occurred. Under these circumstances it is a well recognized fact that the operation of election is not always possible; the physician many times is forced to do something which he appreciates may not be the best but at the time seems justifiable. This shows from another point of view the absolute necessity, if our maternal mortality is to be lowered, of insisting upon continuous prenatal and adequate delivery care.

In nearly 40 per cent of these operative deliveries it was admitted by the physicians that their technic was at least unsatisfactory with regard to asepsis.

Many of these patients were operated upon after very little or no labor, and this explains the frequency of artificial dilatation of the cervix in both forceps and version deliveries. The number of cases in which manual dilatation of the cervix, forceps or version, and manual removal of the placenta occurred, or forceps failed and version was done, was deplorably large. From this it is evident that accouche-

ment forc  was resorted to many times and accouchement forc  is not regarded as good obstetrics today; it gives bad results and should not be performed.

The frequency with which a curettage was done on women who had developed sepsis is surprising, for such treatment has long been condemned. Secondary operations for various conditions, usually of a septic nature, were much too common.

The very fact that cesarean sections preceded one-fourth of all deaths following operations for delivery suggests that there had been unwise selection of cases for the operation, or of the types of operation, or both, as cesarean sections constitute only a small percentage of all operative deliveries in general. Additional evidence to this effect is found in the causes of the deaths following cesarean section. According to statements of the doctors upon interview, 27 per cent of the women died of sepsis, but careful study of each record indicates that 47 per cent were probably septic. The conditions under which the operations were done may account for this high percentage of sepsis. Eighty-five per cent had not been planned. In 31 per cent the membranes were ruptured before the operation was done. Fifty-two per cent of the women had had one or more vaginal examinations. Twelve per cent of the women had had attempted delivery from below. The number of sections done for various types of dystocia after long and exhausting labors is appalling. The tremendous mortality attending cesarean sections throughout the United States warrants a careful review of the indications in the choice of operation.

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Kimura, S.: Clinical Observations on Uterus Bicornis in Pregnancy and Labor. Japanese J. Obst. & Gynec. 13: 154, 1930.

In 52 cases of uterus bicornis, Kimura observed the symptoms of hypoplasia. The average age of puberty was somewhat later than for other women. The percentage of conception was 69.4 per cent and pregnancy was generally associated with complications. Spontaneous, premature labor occurred in 87.5 per cent of the cases. The cause is usually hypoplasia of the uterine musculature. Not one case of twin pregnancy was noted. Among 11 patients who went to term 7 had breech and 4 had occiput presentations. Premature rupture of the membranes occurred in 72.7 per cent. The vaginal septum gave no trouble, and in 4 of the 11 cases it ruptured spontaneously. Labor was usually complicated. Three patients had severe postpartum hemorrhages and one had retention of the placenta. The puerperium was normal in most of the cases.

J. P. GREENHILL.

# Society Transactions

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## THE NEW YORK OBSTETRICAL SOCIETY

MEETING OF JANUARY 10, 1933

The following case reports and papers were presented:

**Report of a Case of an Unusually Large Ovarian Cyst.** Dr. Gordon Gibson.  
(See page 264.)

**Acute Inversion of the Uterus.** Dr. G. H. Davis (by invitation). (See page 249.)

**Sexual Variations of the Pelves and Their Significance in Labor.** Drs. W. E. Caldwell and H. Moloy. This paper will be published in the October issue.

DR. B. P. WATSON.—I have had the privilege of following the work that Dr. Caldwell and Dr. Moloy have been doing on these various types of pelves. I think one of the first things I heard when I came to this city, now nearly seven years ago, was of this male type of pelvis which Dr. Caldwell had become interested in along with his former chief, the late Dr. Studdiford.

It is very extraordinary that obstetricians should have been ignorant of the work which the anatomists and anthropologists had been doing for a great many years on pelves and especially on overlapping in sex characteristics. I can say that because I knew personally two of the men whom Dr. Moloy mentioned as pioneers, or rather not quite as pioneers but workers in this subject, the late Dr. Berry Hart, whose pubiotomy pelvis Dr. Moloy showed, and Dr. Derry, who was a fellow-student of mine in Edinburgh and afterward was Professor of Anatomy in Cairo, and who did his work on the pelvis in identifying and in trying to sex mummies.

I think the presentation we have had is epoch-making in obstetrics. Dr. Caldwell and Dr. Moloy have put something before us which is really worth while, which will lead to a great deal of further investigation and which is going to elucidate many of the obstetric problems which have been puzzling us hitherto, the difficult labor in the woman in whom we thought the ordinary pelvic measurements were normal. It is only when we come to study the outlet, the subpubic angle, the interischial diameter, and above all, the height of the symphysis, the depth of the pelvis, and the form of the sciatic notch that we recognize that there is likely to be difficulty.

Their classification, I think, is a very good working classification at present, but as Dr. Moloy said, this may be subject to modification as the work goes on. The pelvis as they have described it accounts for many of the occipitoposterior positions. Other workers, Thoms especially, have related occipitoposterior positions to pelvic deformity, but no one has hitherto shown us clearly why it is that the head must present in the occipitoposterior position in certain types of pelves. The point Dr. Moloy made that in certain occipitoposterior positions it is very much better and easier to deliver the head occipitoposterior than to try to rotate it, is very important.

## OBSTETRICAL SOCIETY OF PHILADELPHIA

*MEETING DECEMBER 1, 1932*

The following papers were presented:

**Torsion of the Normal Fallopian Tube.** DRs. F. B. BLOCK and M. A. MICHAEL. (See page 268.)

**Influence of Female Sex Hormone Upon Blood Coagulation of the Newborn.** DR. JOHN C. HIRST. (See page 217.)

**The Results of Intrauterine Culture as Obtained With the Sheath Tube.** DR. J. K. JAFFE. (See page 212.)

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*MEETING OF JANUARY 5, 1933*

The following papers were presented:

**The Incidence and Significance of False Positive Pregnancy Reactions.** DR. A. J. ZISERMAN. (See page 204.)

**The Value of the Aschheim-Zondek Reaction in the Diagnosis and Prognosis of Chorionepithelioma.** DR. C. MAZER AND DR. L. EDEIKEN. (See page 195.)

**Direct Intraabdominal Radiation in Advanced Pelvic Carcinoma.** DR. E. A. SCHUMANN. (See page 260.)

**Observations on the Endocrine Diagnosis and Treatment of Amenorrhea and Functional Uterine Bleeding.** DR. B. M. ANSPACH AND J. HOFFMAN. (See page 147.)

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*MEETING OF FEBRUARY 2, 1933*

The following paper was presented:

**Nephritis in Pregnancy.** DR. H. J. STANDER. (See page 183.)

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## BROOKLYN GYNECOLOGICAL SOCIETY

*MEETING OF DECEMBER 2, 1932*

The following case reports were presented:

**Abruptio Placentae (Complete) With Spontaneous Partial Rupture of the Uterus.** DR. S. L. SIEGLER (by invitation). (See page 270.)

**Report of Three Cases of Ruptured Uterus Following Previous Cesarean.** DR. J. CASAGRANDE. (See page 273.)

## "A Simple Procedure of Ascertaining the Sex of the Newborn, Where the Diagnosis Is Difficult Due to Genital Abnormalities"

In the June issue of the *AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY*, Dr. Witherspoon, of New Orleans, describes, under the above caption, what he pronounces an infallible method of determining the sex in the case of a baby with genital malformations. I read his description with much interest, but could not agree as to the positiveness of the diagnosis. In the course of my work in constructing artificial vaginas I have had occasion to examine an unusually large number of cases of genital malformations, in some of which the determination of the sex was by no means easy; but I cannot understand why in the examination of such infants the direct passage of a catheter into the bladder would determine, as claimed by Dr. Witherspoon, that the child is a male. Most of the cases which I have examined have been babes or young girls born without a vagina, and usually with other sex malformations. In those cases the catheter would certainly go directly into the bladder, and by the above test all would have been immediately pronounced males.

In one of my early cases, the patient being about twenty-five years of age with a most distressing inferiority complex, there was a large clitoris present, immediately below which was an opening, just as shown in Dr. Witherspoon's illustration, through which the catheter passed directly into the bladder. The perineum extended forward to this opening, and there was very little tissue in the vicinity to suggest a vulva. There had never been any menstruation or menstrual molimen. The breasts were well developed, and the general appearance of the patient was that of a female, but there was a peculiar voice and an unusual development of hair which suggested masculinity. (Whether the female sex had been determined at the time of her birth I do not know.) If, however, instead of passing the catheter clear into the bladder I turned the end directly downward just after it entered the meatus I could pass it backward through a sort of sinus into what proved to be a normal vagina.

At the operation I split the perineum backward until I reached the normal vagina; then, as best I could, I attached the mucous membrane of the vagina to the skin, constructed a pretty good vulva and amputated the clitoris. The vagina was found to be normal, and at the fundus was an infantile uterus. Because of the male manifestations, as shown by the voice and hair, I opened the abdomen. On the right side of the infantile uterus a normal tube and ovary were found but on the left was a normal testicle, which was removed. The patient made a prompt recovery, the inferiority complex disappeared, she was married that fall and scarcely a year elapses that she does not drop in to express her gratitude and assurance that she is "the happiest woman in Ohio." She is one of the most active women in her town.

In consulting available literature on the development of this part of the embryo, I fail to find anything to confirm the view of Dr. Witherspoon. The illustrations, especially figure "B" on page 236 of *Embryology* by Charles W. Prentiss, of the University School of Medicine of Chicago (1915), seem to suggest the ease with which the vagina could pass forward so as to enter the urethra at right angles and produce just such a condition as I found in the case alluded to above; and yet in such a case in introducing a catheter it would slip directly into the bladder. I have discussed this matter quite at length with Professor Landacre, Professor of Embryology in the Medical Department of the Ohio State University, who fully confirms my view as to the inadequacy of the proposed test. I am quite certain that by that test practically all babies with absence of vaginas would be forthwith pronounced males.—J. F. BALDWIN, M.D., Columbus, Ohio, July 10, 1933.



# Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

## Collective Review

### TRENDS IN GYNECOLOGY AND OBSTETRICS DURING 1932

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THIS year we are innovating a departure from the customary, yearly collective review. Instead of discussing individual papers we attempt to review tendencies in gynecology and obstetrics. For this purpose we have gone over the topics chosen for discussion at various national and local obstetric and gynecologic societies in the United States, Great Britain, Germany, Austria, Hungary, Japan, Switzerland, Belgium, Italy, and Scandinavia. A few papers of importance not read before any society but pertaining to the subjects under discussion have also been included. In recent years more progress has been made in gynecology than in obstetrics due particularly to advances in the study of endometriosis, radiotherapy, and endocrinology. Because of this, a disproportionately large amount of space in this review is devoted to gynecology.

#### ANALGESIA AND ANESTHESIA

One of the chief topics for discussion before the Royal Society of Medicine was "Modern Methods for Alleviating Pain in Childbirth." Rivett maintained that the ideal anesthetic was nitrous oxide gas and oxygen. He was of the opinion that chloroform is excellent as an analgesic but dangerous as an anesthetic. In the discussion Paramore advocated spinal anesthesia and episiotomy together with forceps delivery. Charles pointed out that gas and oxygen were satisfactory but it was impossible to have the necessary apparatus always at hand. In his experience the results with the barbiturates were not convincing, ether was objectionable, and chloroform was the best anesthetic of all. Gibbons likewise favored chloroform.

Stander (O)\* reported the fifth case of delayed chloroform poisoning which occurred on the obstetric service of the Johns Hopkins Hospital. Four of the five patients died. The only hope for recovery in these cases is offered by intravenous glucose therapy and antiacidosis measures such as sodium bicarbonate intravenously. Stander emphasizes that the only place for chloroform in obstetrics is late in the second stage at which time it should be administered in whiffs. Even then it should be used only when no other anesthetic is available.

Ruth and Paxson (O.S.Pa.) found that sodium amytal has two disadvantages, first administration requires some technical skill and second the drug produces restlessness. When given intravenously in conjunction with nitrous oxide-oxygen, it presents the following advantages: An immediate positive action, accurate control of dosage, no injurious effect on mother or baby, no deleterious effect on labor, it furnishes a method of treating spastic cervix or retraction ring, and it gives definite rest. In discussing this paper J. C. Hirst said he observed that sodium amytal by mouth is much easier to administer and just as effective as the intravenous route. Rectal administration required excessive nursing attention because of restlessness. Paxson agreed that giving the drug by mouth is easier but the danger of restlessness is markedly increased. Pride (M.S.C.M.S.) obtained good results with rectal administration.

\*For code see end of article.

Littell's studies (O) revealed that sodium amytal has no injurious effect on the newborn child when given in the customary doses as an obstetric analgesic or anesthetic. Nelson (O) believes the combination of sodium amytal and scopolamine causes complete amnesia in the majority of cases if given early. It does not slow labor or affect the baby, it saves general anesthesia and is far less expensive. Bohler (S.O.G.S.) obtained good results with pernocton but found that in at least one-fourth of the cases there was marked excitation requiring close supervision; the analgesia lasted only a relatively short time and in some cases there was a toxic effect on the baby.

Lull (O.S.Pa.) advocated the combined use of the barbiturates with ether by rectum but he cautions that the physician should be prepared to deliver the patient with outlet forceps. Vaux believes this combination should not be used as a routine and J. C. Hirst emphasized that patients receiving this combination must be watched after the birth of the baby as well as during labor.

In contrast to these favorable reports on the use of sodium amytal, the experience of Shir and Daichman (B.G.S.) with this drug has been disappointing. These authors found that in most cases large doses of the drug will give satisfactory analgesia, amnesia, and relaxation of the soft parts. However, these advantages are greatly outweighed by the frequent occurrence of marked restlessness, an increase in the number of instrumental deliveries and frequently narcotized babies.

Avertin is considered by Cochran (B.G.S.) to be a safe analgesic agent, it does not prolong labor or increase the incidence of operative delivery and it produces a successful state of analgesia and amnesia in most cases. Likewise Peterson and Pierce (O) believe avertin more nearly approaches the ideal anesthetic than any other drug which they employed. However, while Morgan (O) considers this drug to be safe it is nevertheless uncertain in its action.

Averett, Sussman and Zimring (O.S.Pa.) reported on the use of spinal anesthesia in 896 gynecologic and 35 obstetric cases. They obtained very satisfactory results with neocaine in the gynecologic cases and with gravocaine in the obstetric ones. Cosgrove (A.S.R.A.N.Y.A.M.) advocated lumbar anesthesia in obstetrics, and Siegert (O) highly recommends this form of anesthesia for cesarean sections. Gabriellanz (C.G.S.) favors spinal anesthesia in gynecology and considers spinocaine the safest drug. Eades (B.O.S.) is of the opinion that spinal anesthesia with novocaine crystals and spinocaine has a definite place in abdominal obstetric surgery when the use of general inhalation anesthesia is contraindicated. Holder (O) found nupercaine to be a safe and satisfactory agent for spinal anesthesia when used for operations below the diaphragm. Rouffart-Marin (B.S.G.O.) believes in the superiority of percaine for spinal anesthesia and Gengenbach (U.R.O.G.S.) said that percaine is preferred for spinal anesthesia at the Basel clinic. Mayer favored novocaine. Labhardt said that even though his results with spinal anesthesia have been good he preferred narcosis and direct infiltration anesthesia. Walther also favored the latter form of anesthesia. Seitz mentioned that although he frequently used spinal anesthesia when most of his patients were peasants he seldom resorted to this form of anesthesia for his urban patients because of the frequency of headaches.

Frigyesi (V.O.G.S.) reported on 500 gynecologic cases in which he successfully induced anesthesia by infiltrating the abdominal wall with novocaine and injecting the anesthetic sideways into the region of the third lumbar vertebra. Finshterer prefers parasacral and Adler favors direct infiltration anesthesia.

#### STERILITY

Before the Northern Scandinavian Society of Surgeons, Björkenheim discussed the causes and treatment of sterility in women. In only about 10 per cent of his 524 cases did he find the male at fault either directly or indirectly. He believes that hysterosalpingography is less dangerous than the Rubin test. Natvig is of the opinion that in Norway sterility is 8 to 9 times as frequent in women as in men, and that about one-third of all sterility in women is due to hypogenitalism and the rest to acquired diseases. Chydenius reported 30 cases in which he employed salpingography but Settergren considers the injection of iodized oil a dangerous procedure and, therefore, he does not use it. The latter author reported 94 cases where operations were performed for sterility. Gestation followed in 36 per cent.

Keene and Payne (O.S.Pa.) outlined in detail their method of investigating sterility. They include a careful history of both husband and wife, physical examination of both, the special gynecologic examination, tubal patency tests and laboratory investigations. Special emphasis is placed on the endocrine glands. Mayer and Hoffman elaborated further on the detection and treatment of the endocrine disturbances which result in sterility. Cary (O) also discussed the essentials of a diagnostic survey of sterility. Stein and Levinthal (A.M.A.) reported an analysis of 300 couples presenting sterility problems. After treatment, pregnancy occurred in 17.3 per cent.

Rubin (O) shows that appendicitis plays a distinct rôle in the etiology of female sterility and he advocates appendectomy for even slight attacks of appendicitis in young women.

Reist (S.G.S.) discussed the tubal patency test as an aid in the diagnosis of sterility due to tubal closure. Anderes preferred salpingography to the Rubin test in most cases but Frey did not. The latter agreed with Reist that in all cases a bacteriologic examination should be made before the patency of the tubes is tested. The patient should remain in a hospital for twenty-four hours after the test is performed.

Rubin (A.G.S.) reported the results of twelve years' experience with his uterotubal insufflation test. He observed no serious sequelae in the 3600 tests he performed. With the aid of the kymograph he can detect the presence of tubal patency, nonpatency, tubal stenosis, peritubal adhesions, and uterotubal spasm. In most instances it is possible to locate the site of obstruction. Rubin points out that tubal insufflation has a definite therapeutic value in sterility because it was the only treatment employed in 62 per cent of 398 cases where pregnancy followed its use. Improvement of dysmenorrhea was observed after insufflation in 66.6 per cent of 57 patients. N. F. Miller observed no complications in 400 of these tests but he prefers to inject opaque substances and control them under fluoroscopic examination. Heaney found the test useful when operating for fibroids in young women. If before the operation the tubes are found open, the patient may be told there is a possibility of a myomectomy being done. If, however, the tubes are closed, a myomectomy should not be done. Norris suggests using the Rubin test before employing intrauterine radium for benign hemorrhages when there is a question as to the condition of the tubes.

Rubin (N.Y.O.S.) demonstrated how the diagnosis of nonpalpable tubal adhesions and tubal stenosis can be made by uterotubal insufflation with the aid of the kymograph. The diagnosis is based upon the fact that tubal contractions in the presence of these lesions are completely absent or markedly changed. Cary emphasized the necessity for routine bimanual examination after insufflation because in some cases a distended tube may be felt.

v. Mikulicz-Radecki (N.E.G.G.S.) reported his experience with graphically recorded Rubin tests. He believes this procedure yields as much information as salpingography, it is cheaper and requires less time to perform. Benthin is not strongly in favor of tubal patency tests, whereas Fuchs finds the test valuable. Sturgis (O.S.Pa.) claims the injection of lipiodol is of direct therapeutic value in certain cases of sterility.

Schmitz (C.G.S.) found reports of 429 salpingostomies in the literature. The incidence of full-term pregnancies following these operations was 10 per cent. There were two pregnancies after Schmitz's 15 tubal transplantations and salpingostomies. Stein and Greenhill each reported two pregnancies after salpingostomy. Serdukoff (O) maintains that the incidence of favorable results after tubal implantation varies from 20 to 33 per cent.

Holden and Sovak (A.G.S.) reported an improved technic for reconstructing oviducts. They perform a circumcision operation for occlusions in the outer third of the tube and implantation for stenosis in the inner two-thirds. Watkins (O) also presented a new method for implantation of the tube into the uterus. Sovak (N.Y.A.M.) devised a syringe which is especially adapted for intrapelvic tubal insufflation.

Reiprich (G.G.S.) discussed the operative treatment of tubal sterility and also the results of his animal experiments. In rabbits he performed auto- and homiotransplants of fallopian tubes and in addition he transplanted an entire uterus from one animal to another. His experiments proved that transplants of the whole uterus can function successfully.

## ENDOCRINOLOGY

It is impossible in this review to take up more than a few discussions especially because the more one reads of the experimental work in this field the more confused one becomes. It is to be hoped that during the next few years this subject will be clarified particularly because at the present time, physicians are using endocrine products in a most haphazard fashion.

At the last German Gynecological Congress important papers were read by Zondek, Aschheim, and Guggisberg. According to Zondek, the anterior lobe produces three and perhaps four hormones, one of which controls growth, another ripening of follicles, the third luteinization and the fourth metabolism. These hormones are not specific for they are identical in human beings and animals, and they are produced throughout the entire life of the individual. The same amount is found in the human male and female hypophysis. Zondek also took up the biologic activity of these hormones, their diagnostic significance and their clinical application. Aschheim discussed the importance of the anterior lobe in obstetrics and gynecology. He collected from the literature reports of 4000 cases where the Aschheim-Zondek test for pregnancy was used and it proved to be correct in more than 98 per cent. He admits it has not yet been decided as to whether the hormone in question arises in the hypophysis or in the placenta. Guggisberg considered the posterior lobe of the pituitary. He pointed out the strong excitator effect on the uterus and other smooth muscle, its antidiuretic effect and its influence on pigment cells. He maintained that in lactating animals injections of posterior pituitary increased the secretion of milk. The significance of this hormone for the induction of labor requires elucidation because animals in which the hypophysis has been removed have normal labors.

At the A. G. S. meeting Zondek again took up the relationship of the anterior pituitary to genital function. He expressed the opinion that a definite answer concerning the chemical identity of the anterior lobe hormone and that obtained from the urine will not be forthcoming until both substances will be available in pure form. Likewise chemical analysis will solve the question as to whether prolactin is a single hormone or a mixture of two. Zondek reviewed his evidence which tended to prove that the anterior pituitary activates the ovaries for sexual function. He also discussed a new procedure known as "Hormonal Tissue Diagnosis." He found that in the presence of benign genital tumors in women there is an increase of prolactin A elimination in the urine in about 20 per cent of the cases; it rises to 36 per cent in cases of extragenital carcinomas and to 80 per cent in cases of malignant genital neoplasms. In the discussion Frank maintained the belief that there is only one hormone which is responsible for both follicle growth and luteinization. He also said he tried to duplicate Zondek's work on tumors but his results were disappointing.

Loeser (B.G.O.S.) found anterior lobe hormone in the skin of pregnant women but he could not find follicle hormone. Therefore, a skin test may be devised some day which will dispense with the Aschheim-Zondek animal test. Thus far attempts to devise such a test have failed. This paper was discussed by Zondek, Aschheim, and Philipp. The last named found much more hormone in the chorion of early pregnancies than in the same amount of full-term placental tissue. He emphatically stated after a study of 35 pituitary glands taken from pregnant women that this gland in pregnancy contains no hormone. Hence the placenta is the source of the hormone.

Dodds (R.S.M.) made a statement with which all gynecologists will agree, namely that the developments in sex hormone research have been so rapid that it is impossible for any one person to be fully up to date. He reviewed the recent research in this field and Parkes took up the standardization of extracts of the sex glands. The latter pointed out that it would be necessary to give a woman 500,000 mouse units to produce any estrus effect and that at the present time this is financially impossible. A number of men discussed this paper and Bonney expressed the hope that Dodd's paper would act as a corrective to the credulous optimism which resulted in the production of worthless papers and worthless therapy.

At the first Congress of the French Gynecological Society, Jayle reviewed the anatomical and clinical relationships between the hypophysis and the ovaries but nothing new was presented. Hallion (F.G.S.) then elucidated the physiologic connections between these two glands of internal secretion as based upon experimental facts and likewise added nothing original. In the discussion Aron said he did not believe the pituitary elaborates two hormones. He maintains there is only one hormone which produces both maturation and luteinization depend-

ing upon the amount present. Furthermore it has not been proved that the hormone in the urine of pregnant women arises in the hypophysis. There is more evidence to point to its origin in the placenta. Laroche and Simmonet reported good results in 75 out of 100 cases where they used anterior pituitary hormone clinically for regulation of the menses. Seven papers on endocrinologic subjects were read before the Kinki Gynecological Society (Japan) but nothing new was presented.

Experimentally, Fluhmann (A.G.S.) proved that when the rabbit's uterus undergoes the changes brought about by the ovarian hormones estrin and progesterin, it acquires the power of responding much more actively with macrophages to traumatic stimuli. He suggested that attention be directed to the possible use of sex hormones in the treatment of pelvic inflammatory disease.

Miklos (G.S.H.M.S.) maintains that the corpus luteum produces at least two hormones, one of which produces the pregravid change in the endometrium and the other regulates the duration of pregnancy.

Based upon a brilliant series of experiments Dorn and Sugarman (O) found that by injecting rabbits fully three months old whose testicles were in the inguinal canal, with urine from pregnant women in between five and ten months of pregnancy, they were able to prognosticate the sex of the unborn child in 80 out of 85 cases.

Anspach and Hoffman (O.S.Pa.) started an endocrine clinic for the study of amenorrhea, uterine bleeding, and sterility. They found that the picture presented by the endometrium proved the most important single observation in estimating ovarian function, that thyroid products are one of the most reliable preparations at our command and that the roentgen ray when judiciously applied, seems to be an important therapeutic agent in combating endocrine dysfunction.

Gragert (N.W.G.G.S.) produced menstruation in five women who had oligohormonal secondary amenorrhea by means of anterior pituitary and sex hormones. On the other hand Kurzrok and Ratner (O) found that in their cases of amenorrhea accompanied by genital hypoplasia the excretion of follicular hormone in the urine was slightly greater than normal. Hence the administration of follicular hormone for therapeutic purposes could not and did not produce either a cure or improvement. Violet (F.C.G.) obtained good results in amenorrhea by small venesections. In the discussion, Pierra favored local venesection in the form of cupping scarified areas in the region of the ovaries for both amenorrhea and dysmenorrhea. Ford and Mueller (O) question the value of the Frank test for the determination of the concentration of the estrus-producing hormone in the circulating blood.

A review of the literature and an analysis of the answers received to 1000 questionnaires convinced Sellers (S.M.A.) that the cause of dysmenorrhea is still unsettled and that the best results are obtained by prolonged dilatation of the cervix.

Novak (O.S.Pa.) is of the belief that primary dysmenorrhea is due to a heightened irritability of the uterine muscle which occurs usually a day or two before the onset of menstrual bleeding, when the withdrawal of the inhibiting corpus luteum hormone takes place. He, therefore, advocates as part of the treatment the use of the so-called luteinizing substance prepared from the urine of pregnant women. This form of therapy is based upon the physiologic studies made by Novak and Reynolds (A.M.A.) in which it was shown that female sex hormone or theelin is an excitant and progesterin an inhibitor of uterine motility.

Koller (S.G.S.) in discussing genital hemorrhages in young girls advocated the routine analysis of the blood and urine to find a basis for hormone therapy which, however, up to the present time has been disappointing. He emphasizes that in the final analysis patience accomplishes more than manipulation. Exchaquet (S.G.S.) reviewed the literature on the matter of the metrorrhagias at puberty and admits that the literature on this subject is very confusing. Eight men discussed the latter two papers but added nothing.

Keene (I.M.S.) discussed the diagnosis and treatment of functional bleeding. In these cases Geist and Glassman (O) found that neither from the type of bleeding, the duration of the symptoms nor the histologic data can a definite prognosis be made. All cases (except the puberty cases) should be curetted and observed and if necessary recuretted before more drastic steps are taken. Novak (S.M.A.) has recently obtained encouraging results in treating functional uterine bleeding by means of an anterior luteinizing substance obtained from the urine of pregnant women. The idea back of this treatment was to activate luteinization in the ovary and, as lack of lutein tissue is the chief ovarian factor

in this disorder, this treatment appears rational. However, the effect of the therapy appears to be temporary.

C. J. Miller (A.C.S.) presented a thorough discussion of the modern conception and treatment of uterine bleeding. Frank (A.G.S.) mentioned the success obtained with the injection of venom of the moccasin snake in cases of uterine hemorrhage in which the usual forms of therapy had failed.

Kantor and Klawans (C.A.O.G.) found that 68.4 per cent of the women in their series who had postmenopausal bleeding had a malignancy. Therefore the axiom, "All cases of postmenopausal bleeding should be considered as malignant until proved otherwise," is significant.

Geist and Spielman (O) used theelin and amniotin to relieve the symptoms of the menopause. They found that substitution of the female sex hormone alone does not in all cases relieve the menopausal syndrome. Amniotin was superior to the other therapeutic agents used by the authors.

Hofbauer (O) warns that the prolonged use of hypophyseal preparations may lead to harm especially in women with diminished ovarian function. He found this to be definitely true in experimental animals.

(Discussions on the hormone tests of early pregnancy have been omitted because their value is universally conceded and nothing new about them has been added during the past year.)

#### LATE TOXEMIAS OF PREGNANCY

In experiments on animals Titus, Messer, and McClellan (A.G.S.) attempted to imitate an eclamptic process by administering sublethal doses of guanidine. The animals showed progressive lethargy then paralysis and finally convulsions followed by death. Suggestive changes in the liver were found. On the other hand, Stander (O) maintains that the blood guanidine is not markedly elevated in eclampsia and that intravenous administration of this substance in the rabbit does not produce liver necrosis. Calcium therapy in eclampsia does not appear rational on the basis of blood guanidine, blood sugar or blood cation ratios.

Toombs (A.A.O.G. & A.S.) was convinced that in the theory of focal infection as a factor in pregnancy toxemia, we have a more rational basis upon which to work out an effective therapy than any which has heretofore been brought to our attention. LaVake agreed with Toombs whereas Titus and J. E. Davis disagreed.

As the result of animal experimentation Bartholomew and Kracke (A.G.S.) are of the opinion that autolysis of placental infarcts is the cause of eclamptic toxemias and that eclampsia and abruptio placentae probably differ only in the location of the infarcts. Neither Morse nor Fraser agreed with these authors, but Kerr (E.O.S.) believes that the onset of toxemia is probably due to the products of protein autolysis, degenerated villi, and placental infarcts.

Wirz (M.R.O.G.S.) studied the connection between atmospheric disturbances and eclampsia but found no direct influence. Harding and Van Wyck (N.Y.O.S.) maintain that the edema theory of Zangemeister offers the most unifying view of the toxemias of later pregnancy. However, it requires modification to allow for the formation of edema in individual organs and for the possibility of internal changes in water distribution. These authors have demonstrated that hypertonic saline solution exaggerates the symptoms of the toxemias of pregnancy.

Janney and Walker (A.M.A.) discussed the conjunction of *intercurrent disease* with lowered functional capacity of the kidney in the latter weeks of pregnancy as a precipitating factor in toxic states. Rowe (A.M.A.) found evidences of disturbed function of the liver in many women who had toxemia but not in all.

According to Stander, Ashton and Cadden (O), of the Mosenthal, phenol-sulphonaphthalein, diastase, thiosulphate, urea concentration factor, urea clearance, guanidine, and creatinine excretion tests only the latter three proved of real value in the differentiation between mild nephritis and the other toxemias of pregnancy. These authors recommend the urea clearance and creatinine excretion tests as a routine in all cases of toxemia where the diagnosis is not clear. On the other hand, MacKenzie (O) insists that the routine chemistry of the blood and urine is of little value in differentiating the hepatic and the nephritic toxemias of pregnancy. However, he maintains that urobilinuria is usually not present to a pathologic degree in nephritic toxemia but it is generally found in the hepatic types.

In the treatment of eclampsia Gerrard and Newton (N.E.O.G.S.) preferred conservatism in the form of a combination of the Stroganoff and Dublin methods. Their best results were obtained with a combination of morphine, camphor preparations, magnesium-sulphate, glucose, gastric lavage, colonic lavage, and chloral hydrate. Eight individuals discussed this paper and apparently favored conservative therapy. Upshaw (A.M.A.) secured the best results in his series of eclamptic patients by means of morphine, magnesium sulphate, and intravenous glucose. King, Lewis, Schreier, and Plass also spoke in favor of conservative treatment. Arnold and Fay (O) prevent and control eclampsia by means of fluid limitation and dehydration.

Vogt (S.E.G.S.O.G.) advocated the use of pernocton in the treatment of eclampsia. Four discussants agreed that this drug was helpful but one expressed the fear that it led to severe kidney damage. Bohler (O) and Schwanen (O) likewise favored pernocton in the treatment of eclampsia. Hamblen and Hamblin (O) controlled eclamptic convulsions by means of sodium amytal in all their cases and King, Mayer, and Ayo (O) and also Watt (O) obtained the same results. Schey (G.S.R.H.M.S.) suggested the use of thymophysin to hasten labor in cases of eclampsia.

Peckham (N.Y.O.S.) previously showed that 22 per cent of women with eclampsia will be found to have signs of chronic nephritis several months after delivery. Excluding this condition as well as hyperemesis, he found that 40 per cent of the remaining toxemic women likewise show signs of renal involvement during the puerperium or later. He collected 32 cases where nephritis after delivery was probably due directly to a toxemic condition which developed during pregnancy. He emphasizes that the custom of classifying a given toxemia by the blood pressure and urine findings during pregnancy or even at the time of discharge from the hospital is fallacious. Bunzel found that if women who had toxemia subsequently became pregnant they had a 69 per cent chance of a recurrence and only a 60 per cent chance of having a live child. Rucker (A.A.O.G. & A.S.) found recurrences of toxemia in from 16 to 27 per cent of his cases. Young, Sym, and Crow (R.S.M.) followed up 239 cases of eclampsia and albuminuria and found that 20 per cent suffered from grave impairment of health and in 2.1 per cent death had occurred subsequently. They observed that the degree of disability was greatest in those women who were exposed to the toxemia the longest time. Browne, Fairbairn, and Wyatt agreed that there were serious effects after toxemia of pregnancy, but Rivett said that in his experience patients who had eclampsia did not develop toxemia in a subsequent gestation. McIlroy likewise denied that toxemia was likely to recur. In her opinion bacillus coli had something to do with the toxemias of pregnancy and she believed the state of the teeth was a causal factor. Another investigator of this subject was Schultz (N.W.G.G.S.), who examined 92 women after they had had eclampsia. He failed to find serious kidney damage in a single one.

In the opinion of Anselmino, Hoffmann, and Kennedy (O) nephropathy in pregnant women and eclampsia is due to disturbances in the glands of internal secretion. The substance which is mostly responsible for these disturbances is an uncompensated overproduction of the antidiuretic component of the posterior lobe of the pituitary gland.

#### LABOR

At the last meeting of the German Gynecological Congress important papers on the care of pregnant women were read by Hirsch and by Sellheim. The former began with the care of young girls in childhood and carried this theme through puberty, adulthood, pregnancy, labor, and the puerperium. He emphasized that those responsible for the welfare of women are physicians, midwives (in Germany and other European countries), nurses, and social organizations. Sellheim's subject was "Careful Delivery" and he outlined a method of managing labor which is safe for both mother and child. He emphasized that we have the means of easing the difficulties of labor which are the result of the present-day manners of living. Beck (A.M.A.) is firmly convinced that normal labor should be allowed to proceed along physiologic lines and that nothing should be done to interfere with the natural mechanism. The routine of labor he describes has given very satisfactory results. Bland (A.M.A.) discussed the prevention of maternal injury which may be associated with pregnancy and labor, and Litzenberg (A.M.A.) took up the matter of preventable

invalidism following childbirth. The latter was most emphatic in presenting evidence to show that the ultimate welfare of the parturient woman cannot be secured by good antepartum and intrapartum care alone but requires equally good postpartum attention. Bingham (A.M.N.N.J.) claimed that by means of diet and exercise the following complications may be reduced: toxemia, abruptio placentae, difficult forceps deliveries, lacerations, cesarean section, subinvolution, postpartum hemorrhage and shock, infections, premature labor, and stillbirths.

Frey (U.R.O.G.S.) advocates counting the number of uterine pains after rupture of the bag of waters. He showed the value of such charts in deciding upon the prognosis and the method of delivery. He again (G.S.G.S.) discussed this matter as it pertains to the conduct of labor in cases of contracted pelvises.

Solomons (R.S.M.) reviewed the differences in the methods of obstetric diagnosis and treatment at the Rotunda Hospital in 1909 and 1929. He found a marked increase in the cases of disproportion and of abruptio placentae. He now prefers the cervical to the classic cesarean section and is a convert to the method of inducing premature labor by puncture of the membranes. Slemons (L.A.O.S.) also is strongly in favor of inducing labor at term by rupturing the bag of waters. He describes the method which has given him excellent results in 132 cases. Dallera (P.M.S.S.) ruptured the membranes artificially in 87 cases and found that labor was considerably shortened in these cases. He is now of the opinion that the bag of waters is not absolutely necessary for dilatation of the cervix. Kreis (S.G.S.) obtained short labors by systematically rupturing the bag of waters in all head and breech presentations regardless of the amount of dilatation, provided labor had begun. An additional aid was the use of antispasmodics in all cases of uterine spasm during the first stage of labor. He maintained that the evil effects of spontaneous premature rupture of the membranes are due to spasm of the uterus. Guggisberg (S.G.S.) also presented a paper on the medical conduct of labor and favored the combination of thymophysin and narcotics.

Willi (G.S.G.S.) obtained good results by using thymophysin in 200 cases during the first stage of labor. Frey preferred the use of twilight sleep to hastening labor and expressed the opinion that thymophysin and pituitary extract were qualitatively identical. Greenhill (C.G.S.) agrees with this statement. He and Paddock (S.M.A.) see no more indication for the use of thymus and pituitary extract in normal labor than there is for ordinary pituitary preparations. Neither can Roques and MacLeod (O) recommend thymophysin. On the other hand, Temesvary (O) and Laubscher (O) strongly advocate the use of this drug.

Gheorghiv (B.S.G.O.) suggested the routine revision of the uterine cavity after labor as a prophylactic measure against infection and claimed that in 30,000 to 40,000 cases the morbidity was only between 3 and 4 per cent. Most of those who participated in the discussion of this paper opposed the method as a routine.

Danforth (C.G.S.) took up the treatment of occiput posterior and described the method of manual rotation which has yielded excellent results in these cases. Holmes concurred with Danforth in condemning instrumental rotation. Scott (C.A.O.G.) analyzed a series of 144 cases of occiput posterior in 51 of which the occiput had to be rotated. This was accomplished manually in all but one case.

In a discussion on the difficulties and dangers of forceps delivery, Plass (A.M.A.) gave excellent advice on how to minimize the risks involved. An analysis of 535 cases of mid and high forceps revealed to Acken (B.G.S.) that the maternal mortality was only one-tenth that due to cesarean sections. Piper (A.G.S.) described a new axis traction forceps which Caldwell maintained simplifies forceps operations but he cautioned that it must be used with great care and skill. DeLee and Vaux condemned the forceps as dangerous.

In taking up the subject of breech presentations Glassman (N.Y.A.M.) favored external version. Likewise Studdiford (A.M.A.) recommends external version between the thirty-second and thirty-eighth weeks of gestation. During labor he advocates a policy of watchful waiting for the average operator rather than extraction at the beginning of the second stage. In the 170 cases of breech presentation analyzed by Mohler (O.S.Pa.) there was a gross mortality of 35.2 per cent but only 13 babies were lost from some accident of delivery. Schwarz (S.M.A.) is convinced that the poor results obtained in breech delivery are due chiefly to traumatization and secondly to asphyxia. He describes his technic.



Baer, Ries and Lutz (A.G.S.) maintain that the well-recognized dangers inherent in delivery by high forceps justify a marked diminution in the frequency of this type of delivery. They also prove that the margin of safety for the parturient following version and extraction is much greater than that offered by cesarean section. Potter (M.M.S.) again describes his technic of performing elective version.

Naguib Bey (B.M.A.) reported the unusual experience of having observed 110 cases of rupture of the uterus all of which were due to neglect and inexperienced interference in cases of obstructed labor. Only one of the cases represented rupture of a cesarean section scar. The mortality of laparotomy was 55 per cent and of expectant treatment excluding moribund cases, it was 56 per cent. Stevens advocated "shockless anesthesia" for cases of rupture of the uterus by the injection of morphine and infiltration of the abdominal wall with novocaine.

#### CESAREAN SECTION

In a discussion on cesarean section Wodon (B.S.G.S.) described the various types of the operation. He prefers the cervical operation and makes a transverse incision in the lower uterine segment in clean cases and a vertical incision in infected cases. Rocmans (B.S.G.O.) maintains that the mortality for clean cases is about the same for the corporeal and cervical cesarean sections. In impure cases it is decidedly greater in the corporeal type. He favors the cervical operation because there is less danger of infection, shock or hemorrhage than in the classic operation. Cocq (B.S.G.O.) reserves the high operation for clean cases and the low one for patients who have had a test of labor. The latter two papers were discussed by four individuals, two of whom use only the low operation, one employs the high operation exclusively and the fourth performs the classic operation only when speed is essential.

Mansfeld (R.H.M.S.) prefers the technic of Doerfler in which after the uterus is brought up outside of the wound a transverse incision is made in the lower uterine segment but the bladder is not stripped down. Richter (D.G.S.) gave up the classic operation in 1921 and has been performing the cervical operation routinely since then. He urges however, that the incision in the abdominal wall and in the lower uterine segment be made sufficiently large to permit delivery of the child by extracting the feet first. In discussing this paper Fischer recommended the Portes operation for infected cases. Peters prefers the classic operation and in order to render the field of operation bloodless, he injects pituitary extract into the proposed line of incision in the uterus. Albert agrees with Peters but Prüssmann prefers the cervical operation.

Skeel and Jordan (A.A.O.G. & A.S.) reviewed 1,047 cesarean sections which were performed in the Cleveland registration area. Their analysis showed that the low operation has a definitely lower mortality rate than the classical. They recommend the former operation for all potentially infected cases but advise that the Porro operation be done in the presence of definite sepsis. Cesarean section is not good treatment for eclampsia because the mortality is unjustifiably high. Phaneuf performs the cervical operation almost exclusively but he now prefers the transverse incision. Mathieu reviewed the results for the city of Portland, Oregon, McCord those for Atlanta and Jackson the cases in his private practice.

Shumann (N.Y.A.M.) discussed the elective cesarean section as a prophylactic measure against obstetric mortality and morbidity. He prefers the classic operation for these cases because the cervical one is more difficult to perform, it requires more time, extraction of the child is difficult because of the lack of distention of the lower uterine segment, the additional protection afforded by it against peritonitis is unnecessary and lastly it does not lend itself to local anesthesia as readily as the high operation.

In discussing the contraindications to cesarean section, Cook (A.M.A.) points out that most fatal cesarean sections are performed in the presence of contraindications. The universally recognized contraindications are actual or potential infection in the genital tract, lack of valid indication for the operation and the convulsive stage of eclampsia. This author points out that even in unskilled hands the procedures alternative to cesarean section carry a total maternal mortality risk from shock, hemorrhage and infection less than that of cesarean section performed in the presence of contraindications.

Analyses of statistics on cesarean section were presented by Adams (O) for the city of Portland (217 cases), by Seeley (D.O.G.S.) for Detroit (203 cases) and by Courtiss and Fisher (O) for the Robinson Memorial Hospital in Boston (1,000 cases).

#### ENDOMETRIOSIS

As in previous years Sampson and Novak aired their differences concerning the etiology of endometriosis before the A.G.S. For this year's talk Sampson chose the subject "Pelvic Endometriosis and Tubal Fimbriae," while Novak spoke on "The Morphology of the Genital Epithelia With Special Reference to Differentiation Anomalies." As the years go by, there appears to be less and less divergence in the viewpoints of these two authorities and as Novak said, "It seems possible that before many years have passed Dr. Sampson and I might well be able to present a joint paper on the etiology of endometriosis." A number of years ago Novak conceded that Sampson's implantation theory explained some cases of endometriosis and now Sampson's study shows that at least a certain proportion of cases of ovarian endometriosis are due to direct metaplasia of tubal mucosa into endometrium with subsequent invasion of the ovary. This agrees with Novak's own observations which indicate further that the germinal epithelium itself is capable of such metaplastic transformation into either a tubal or uterine type of epithelium.

A lively discussion followed Sampson's and Novak's papers in which Taussig summarized the present facts concerning endometriosis most satisfactorily about as follows: The tubes are always open, there is evidence of menstrual blood passing out through the tubes, and evidence of a peculiar distribution in the culdesac of tissue that can only be explained as implants. There is definite evidence of the development of various forms of tubal, uterine and even squamous epithelium from the celomic epithelium and there is evidence of traumatic metaplasia at certain points, as at tubal stumps and at the fimbriated ends of the tubes. With these facts in mind we cannot accept just one theory. First, we must agree there occurs metaplasia in various portions of the genital tract without apparent cause. Second, there is definite evidence of implantation both in wounds and in the rupture of endometrial cysts pointing toward the implantation theory. Third, there is the possibility of a certain activating substance passing from the tubal lumen out over the surface of the pelvic organs and giving rise to the development of islands of metaplasia. Taussig believes this latter explanation may be more frequent than we have hitherto thought.

Culbertson mentioned methods of differentiating the epithelial cells of the uterine glands from tubal epithelium. He pointed out that the former are not granular during the ciliated phase or at least the cytoplasm has very few granules whereas the tubular cells have abundant granules. However, the chief difference is that the uterine epithelial cell produces an abundance of glycogen whereas the tubular epithelium does not.

In a discussion before the M.R.O.G.S. Heim took up the development of endometriosis. He maintained that Sampson's theory is incorrect and that the serosal epithelium theory was corroborated by his clinical and anatomical studies. He found that mesothelium, germinal epithelium and endothelium and their genetically associated mesenchyma in the region of the cloaca may become transformed into müllerian tissue.

Allen (C.A.O.G.) found that metaplasia of uterine epithelium may be produced by transplantation into the anterior chamber of the eye in rabbits and also that the uterine epithelium in these animals possesses more marked proliferative and heteroplastic tendencies than the epithelium of the peritoneum.

Before the U.R.O.G.S., Seitz, another authority on endometriosis, discussed the clinical symptomatology of endometriosis with special reference to the significance of the irregularities in the menstrual cycle. He emphasized that the most important and frequent symptom was dysmenorrhea, of which there are two types, (1) premenstrual and early menstrual which occurs chiefly with internal endometriosis and (2) late and postmenstrual which is associated chiefly with external endometriosis. In both types of endometriosis, profuse and prolonged bleeding is common. Chocolate cysts and heterotopic growths may easily be damaged during the menstrual period. In another lengthy article Seitz (O) takes up the etiology, symptomatology and treatment of endometriosis. He uses the term "heteropia of the uterine mucosa" as a synonym for the condition. In the treatment of endometriosis he recommends operation for some cases and radiotherapy for others. He is of the opinion that women who have endometriosis

must be followed up as if they had carcinoma and no opinion as to cure should be ventured until five years have elapsed after treatment. Another excellent and exhaustive article on this subject is the one by Frankl (O) based upon a pathologic and clinical study of 94 cases.

#### GONORRHEA

Marcel (F.C.G.) presented the following conclusions of the French Commission appointed to study criteria for the cure of gonorrhea. (1) No diagnosis can be made without a bacteriologic examination. Slides should be stained with methylene blue and with Gram's stain and gonococci should be diagnosed only if the organisms are found in groups and intracellularly. (2) The diagnosis of a cure rests upon clinical, bacteriologic and where possible serologic evidence. The clinical facts depend upon the history, therapy and complications. The bacteriologic tests should be made after the cessation of all treatment, after attempts at reactivation with beer, silver nitrate, and diathermy and above all following the menses. These examinations must be repeated for a few consecutive months. Serologic tests are technically difficult. Harrison (R.S.M.) likewise laid great emphasis on supplementing the clinical examination of gonorrhea by bacteriologic tests and especially by the complement fixation test which he considers most useful. His favorite antiseptic is mercurchrome but he also advocates vaccines to raise the resistance of the body. In the discussion Abrahams mentioned that it is more difficult to detect the gonococcus in pregnant than in nonpregnant individuals. His criteria for a cure are more stringent than those laid down by the French committee. He does not consider the complement fixation test reliable. Davies criticized local treatment of the urethra and cervix without treating the body of the uterus which in his opinion is very often infected. His experience with diathermy was most unsatisfactory and he was not impressed with vaccines. He considers glycerin the best bacteriocidal substance. Eight others discussed this paper and gave varied opinions concerning the treatment of gonorrhea.

Jacoby (O) pointed out the unreliability of laboratory aids in the diagnosis of gonorrhea in women. He believes that the Gram stain is not essential because the methylene blue stain in conjunction with the clinical examination is adequate for practical purposes. A negative smear even when repeated does not exclude a gonorrheal infection and neither does a negative culture. The complement fixation test is unreliable. Jacoby, therefore, maintains that greater reliance upon the history and clinical evidence will suggest the correct diagnosis in many of the now unrecognized cases of gonorrhea in women.

Royston and Roblee (St.L.G.S.) presented a detailed clinical analysis of 100 cases that received medical heat treatments for subsidiary, subacute and chronic adnexitis and cellulitis including 40 cases of coincident cervicitis treated by surgical heat. Warren and Wilson (A.G.S.) recommend artificial (general) hyperthermia for gonococcal infection. A temperature of 41.5°C (106.7°F.) is maintained in a cabinet for several hours. In the discussion Fluhmann called attention to the use of hot baths (105°F.) for the purpose of producing hyperthermia.

Huggins (A.A.O.G. & A.S.) maintains that there is no greater danger in the removal of gonorrheal tubes within the first twenty-four hours of the onset of the infection than in the operation for an acutely infected appendix. He believes also that in a case where previous attacks have occurred and where the patient has not been free from symptoms between attacks it is much better to operate at once. Babcock agreed with Huggins but Schmitz, Barrett, J. E. Davis and Cooke opposed operation in acute cases of gonorrheal infection.

Ferroni (T.O.G.S.) advocates simple opening of the abdominal cavity in cases of adnexal suppuration (nontuberculous) because in twelve cases where he did this, ten were cured and two were improved after the exploratory laparotomy.

Baldwin (A.A.O.G. & A.S.) advises surgical intervention in cases where there is reason to believe the function of the tubes is lost and their further retention will be a source of discomfort.

In a series of 73 women who had gonorrheal infection of the tubes and who were followed up, Habbe (N.W.G.G.S.) found that 14 or 19.1 per cent became pregnant after conservative treatment. There was only one ectopic gestation in this series. In a series of 26 cases where apparently healthy tubes were left in place when a diseased one was removed from the opposite side, Rupp (O) found that 19 subsequently became pregnant one or more times.

Curtis (A.M.A.) points out that adhesions of the anterior surface of the liver are not infrequent complications of gonorrheal disease of the tubes and that

these adhesions apparently develop during the acute stage of the pelvic infection.

According to Nelson (N.M.S.M.) epidemiologically, gonorrheal vulvovaginitis is sufficiently prevalent to make the problem worthy of consideration. In 1930, 11.8 per cent of all females in Massachusetts who had gonorrhea were under fourteen years of age. Paine (N.M.S.M.) treats vulvovaginitis regardless of whether or not it is gonorrheal in origin by means of soap and water cleanliness and the external use of boracic acid powder. He believes that active treatment with douches, irrigations and application of antiseptic preparations prolongs the inflammatory reaction.

#### CARCINOMA

The centenary meeting of the Section of Obstetrics and Gynecology of the British Medical Association was in reality an international congress. Among the subjects discussed was the treatment of carcinoma of the uterus. The opening paper was presented by Lacassagne who reviewed the statistics of the Radium Institute of Paris. This author expressed the commonly accepted viewpoint that carcinoma of the body of the uterus and sarcoma should be treated by surgery but epithelioma of the cervix is more suitably treated by radiotherapy. The incidence of cures obtained with radium in the author's clinic increased as the technic improved. The 4 gm. bomb in use is helpful but the Institute expects to secure an 8 gm. bomb and by means of it may cure more patients. The immediate mortality was less than 2 per cent and most of the fatalities were due to infection. Voltz presented the results obtained at the Radiological Institute in Munich. He favors routine irradiation of the pituitary gland (as suggested by Hofbauer) in addition to the local application of radium because this not only increases the sensitiveness of the carcinomatous tissue to the action of radium but also improves the general condition of the patient. Bonney of London is a firm believer in the efficacy of the Wertheim operation for carcinoma of the cervix and he reviewed the results obtained in his extensive experience. He has reduced his operative mortality from 20 per cent in his first 100 cases to 9 per cent in the last 128 cases. He maintained that five years of freedom from recurrence is only a 90 per cent cure because in his experience 10 per cent of all recurrences manifest themselves between the fifth and tenth years after operation. G. G. Ward of New York believes the best statistical reports show that radiotherapy is preferable in all cases of carcinoma of the cervix, although the radical operation would give as good results in the early cases but at a high cost of primary mortality and morbidity. He emphasized that reirradiations when properly employed are of definite value in curing local metastases throughout the five-year period of observation. Carcinoma of the fundus is best treated by the combined use of radium and surgery whenever possible. Furthermore, if radium is used, experience and a thorough understanding of the action and application of this powerful agent are essential. Strachan of Cardiff said that in his experience little help was gained from a study of the various grades and types of cells composing the tumor as a guide to radiosensitivity. Maliphant is of the opinion that deep x-ray therapy is necessary in all cases because radium alone is not sufficient to deal with extracervical extensions. In the discussion Berkeley was the only one who agreed with Bonney that the Wertheim operation was the treatment of choice in carcinoma of the cervix.

Faure (F.A.M.) is a firm advocate of early operation for cervical carcinoma and claims that his incidence of cure for these cases was 90.9 per cent. Regaud, director of the Institute du Radium, refuted Faure's statements at the following meeting of the Academy and pointed out that even in the better cases radiotherapeutic methods give results superior to those obtained with the Wertheim operation.

Martindale (R.S.M.) maintained that modern technic in the treatment of carcinoma of the cervix and of the body includes deep x-ray therapy either by the one treatment method, or the fractional method. Simon (V.O.G.S.) reviewed the literature and found that the best results in the treatment of cervical carcinoma were obtained by a combination of radium and x-ray therapy. Before the same Society, Schloss and Maier reported their technic of the treatment of uterine carcinoma with radium.

Jayle (F.G.S.) read a paper on "Abdominal Hysterectomy for Cancer of the Uterus" and at the conclusion he presented the following resolution which was accepted by the French Gynecological Society: (1) The term Wertheim operation is no longer to be used in the Society; (2) Operations should be listed as (a) abdominal hysterectomy with or without salpingo-oophorectomy, (b) enlarged hysterectomy with or without adenectomy and (c) Wertheim operation. The removed must be

specified. Jayle presented this resolution because the operation which bears the name of Wertheim was the result of the contributions of Freund, Ries, Clark and Kelly. At the same meeting Pouliot described Schiller's lugol test for carcinoma of the cervix and said he found the test to be very helpful.

Schmitz (C.A.O.G.) discussed the relationship between the development of the growth and the symptoms of carcinoma of the cervix. He took up the macroscopic findings, the microscopic characteristics, the extent of the tumor, the symptomatology and the correlation of the histologic and clinical signs. At the end of this interesting discourse Schmitz took up methods of preventing carcinoma of the cervix. At the same meeting Newell (C.A.O.G.) presented the five-year end-results in the treatment of carcinoma of the cervix at the Barnes Hospital. Of the 121 cases reported, only 3 patients were operated upon. The rest were treated with radium and x-ray. Keene and Kimbrough (O.S.Pa.) reported that the salvage in their cases of carcinoma of the cervix treated with radium was 18.3 per cent for both early and late cases.

The treatment of carcinoma of the cervix by vaginal hysterectomy and radium is favored by Adler (A.A.O.G. & A.S.) who described his technic and presented his results in 1,000 cases. Jones (A.M.A.) reported a series of 420 cases treated by radium, and he took up the complications of this form of therapy. In the discussion of this paper, Healy and J. E. Davis emphasized the prophylaxis of cancer of the cervix. Crossen (C.C.St.L.C.) dealt with some pertinent facts concerning the treatment of cervical carcinoma. He is strongly in favor of giving the maximum of radiation at the onset of treatment.

The analysis of Auer (O) of the cases observed on the services of Gellhorn and Taussig showed that after the use of radium the incidence of patients who survived a five-year period rose from 4.76 to 11.67 per cent. However, in the early cases of carcinoma of the cervix, Auer believes radical surgery offers the greater hope of cure. For the intractable pain associated with the inoperable cases of carcinoma of the pelvic organs Grant (A.G.S.) recommended cordotomy. In the discussion Keene expressed the belief that this operation merits a greater trial, and R. S. Smith reported satisfactory results in 50 out of 65 cordotomies.

Philipp (B.G.O.S. and G.R.S.) presented a large number of roentgen ray plates to show that bone metastases in cases of uterine carcinoma are not uncommonly present. The bones involved are ilium, spine, pubis, and humerus. Most of these metastases were due to erosion by the primary tumor or involved glands. Hematogenous bone metastases are rare.

In some instances at least, leucoplakia of the cervix is a forerunner of carcinoma. Ries (C.G.S.) discussed erosion of the cervix, leucoplakia, and the colposcope in relation to carcinoma of the cervix. He described Hinselman's colposcope and pointed out its great value in detecting leucoplakia and early carcinoma. He advised that women have periodic colposcopic examinations. In the discussion Lifvendahl presented a simplified instrument. Kretschmer (O) also discussed leucoplakia of the uterine cervix as did Martzloff (P.S.O.G.). Whereas Ries and Kretschmer consider leucoplakia of sinister importance because of its connection with the growth of carcinoma, Martzloff does not believe that the evidence available is conclusive. He believes, however, that Hinselmann's work is of surpassing importance for cancer prophylaxis. Macfarlane and Howe (O.S. Pa.) maintain that the chief means available to prevent cancer of the uterus are periodic examinations and immediate cervical repair after delivery. Prevention of cancer of the cervix is largely the obstetrician's opportunity. Bland agreed with this statement. McGlenn and Foulkrod are convinced that cauterization of the cervix is better than repair or amputation.

Taylor (N.Y.O.S.) presented evidence to show that endometrial hyperplasia is a precancerous lesion in some cases. Hence in older women with hyperplasia an adequate dose of radium is particularly indicated not only to control bleeding but also as a prophylactic measure against the development of cancer.

#### RADIOLOGY

Before the A.G.S., Dannreuther spoke on intrauterine radium therapy as a conservative method of treatment in selected cases of fibromyoma, fibrosis uteri, endometrial hyperplasia, "precancerous" endocervicitis and tuberculosis of the endometrium after bilateral salpingectomy. He found that the menstrual function will be preserved in 78 per cent of cases when the dose is 750 mg. hours or less and the climacteric symptoms are no more pronounced after induction by radium than when the menopause occurs naturally. Women may bear normal babies after moderate doses of radium and this form of therapy is free from

mortality and morbidity. Curtis believes we should advance the age limit from forty to forty-three or forty-four for the application of radium. He reported three cases where carcinoma was found after radium had been used during previous years for a benign condition. Ward reported a similar experience.

Phaneuf (N.Y.O.S.) is of the opinion that radium finds its greatest field of usefulness in women near or at the menopause, having severe hemorrhages from uteri showing no gross macroscopic lesions as in hypertrophy and hyperplasia of the endometrium. However, he also employed this form of therapy in seven cases of puberty bleeding using doses from 400 to 600 mg. hours. This paper aroused a lengthy discussion. Ward suggested giving young girls very small doses of radium with the understanding that the treatment may have to be repeated. Permanent amenorrhea may result from a dose of 500 to 600 mg. hours. He also took up the matter of technic and pointed out the necessity for fastening the radium in situ. Taylor uses only one-half the dose recommended by Phaneuf (1,800 mg. hours) for fibroids and cautions that women should remain in bed a few days after the radium has been removed until the reaction in the peritoneum has subsided. Healy advocated a maximum of 600 to 700 mg. hours for each capsule in benign conditions and he does not apply more than 300 mg. hours as a primary dose for girls up to twenty years of age. Corcoran found that bleeding was controlled in 85 per cent of women who received 1,200 mg. hours whereas it ceased in 97 per cent of those who were given 1,800 mg. hours. He is of the opinion that women who receive 6,000 to 8,000 mg. hours of radium have fewer menopausal symptoms than those who receive only 1,500 to 1,600. He also believes that radium therapy for hemorrhages after the menopause is likely to be followed by trouble years later. He prefers operation in older women. Dannreuther could not agree that it is necessary to use radium at all for menorrhagias of the adolescence. He described the routine treatment which has given him perfect results in these cases. Kaplan found that women under fifty cannot always be castrated with x-rays but that beyond fifty, x-ray castration always occurs. In women under 20, castration is never permanent. Matthews warned against using radium in the presence of contraindications such as chronic inflammation in the pelvis. W. S. Smith found that he had to increase the dose from 1,200 to 2,400 mg. hours in order to secure satisfactory results in cases of metritis. On the other hand Peightal began with 500 mg. hours and gradually advanced it to 1,500 but now finds he can obtain just as good results with only 700 to 900 mg. hours. Phaneuf also is now going back to smaller doses than 1,800 mg. hours.

Cutler (O) discusses the principles underlying the radium treatment of carcinoma of the cervix, and describes and illustrates a technic by which small quantities of radium may be used effectively in the treatment of this disease.

A very interesting and timely paper was the one read by Pemberton (A.G.S.) on complications of radiation treatment in gynecology. He referred particularly to damage done to the bladder and intestinal tract months and years after treatment with radium and/or x-ray for gynecologic conditions. He described the symptomatology and treatment of these complications but also, and more important, means of preventing most of them. One of the best suggestions made is to adhere to the dietum that no patient who has a history of a previous pelvic inflammation or operation should be treated with radium. Healy emphasized that these injuries may occur after as small a dose as 1,000 mg. hours applied within the uterine cavity. Ward took occasion to point out the unnecessary suffering which results from the prevailing opinion that the application of radium is an extremely simple process and that anybody can do it. Minor or severe complications occurred in 21.3 per cent of Ward's 558 cases of cervical carcinoma, whereas, among 106 cases of fundus carcinoma complications were observed in only 11.4 per cent. Hunner is disgusted with the advertisements of commercial radium concerns and asks what the incidence of damage must be in the hands of the inexperienced if even the skilled radiologists have such a high incidence of untoward results.

Macfarlane (O.S.Pa.) found in the literature reports of 29 cases where carcinoma developed after x-ray treatment of the uterus for benign conditions such as myomas (18 cases) and climacteric bleeding (11 cases). Since the number of cases is small, the possibility of a subsequent malignancy should not contraindicate the use of radium or x-ray.

Philipp (G.R.S.) reported the occurrence of bone diseases in women who had received radiation therapy for carcinoma of the uterus. The bones affected were

the hips and the heads of the femurs, hence he warns against too energetic radiation to the patient's sides.

Bernard (P.O.G.S.) reported seven cases where he employed roentgen rays under the mistaken notion that he was irradiating myomas. He admonishes that if a tumor does not diminish in size rapidly after irradiation therapy this form of treatment should be stopped. Faure mentioned that in about 15 cases he has seen irradiated ovarian cysts become carcinomatous.

Caffier (O) reported a series of 33 women who were castrated by means of roentgen rays for various indications, chiefly fibroids, but who returned within three years because of the recurrence of bleeding. Since in recent years there has been an increase in the number of such cases, more care should be exercised in selecting cases for roentgen ray therapy rather than for operation.

#### OPERATIVE TECHNIC

The only operative condition about which there was much discussion last year was prolapse of the uterus. Frank (A.G.S.) followed up 231 patients and found that the results of his operations had been satisfactory in only 66 per cent of his cases. As a result of this stock-taking, he plans to continue his technic for anterior and posterior colporrhaphy in cases of cystocele and rectocele unaccompanied by prolapse of the uterus. However, in cases of prolapse in young women he will use the Fothergill operation and in old women with complete prolapse he will employ a simplified vaginal hysterectomy and in poor operative risks, the Le Fort operation. In the discussion, H. O. Jones said he uses a modified Mayo vaginal hysterectomy and G. G. Ward removes the peritoneal culdesac and unites the uterosacral ligaments to prevent the development of an enterocele. Baer prefers the Halban operation which is applicable in the childbearing period as well as in the menopausal years. Mestitz (O) describes and illustrates the Halban technic. In this operation the vesical peritoneum is pulled out into the vagina until its fixed point on the parietal peritoneum is reached. The fundus uteri is attached to this parietovesical angle in the abdominal wall from below. It is essential to shorten the length of the uterus to three inches by cervical amputation, after which the pelvic floor is repaired.

C. J. Miller (A.C.S.) emphasizes that in young women, unless independent uterine disease exists only those measures should be employed which in addition to correcting the hernia, conserve function and permit safe future pregnancies. For these women Miller prefers a vaginal plastic operation combined with the Simpson modification of the Gilliam suspension. For elderly women he employs vaginal operations, either the Watkins transposition or vaginal hysterectomy.

Maier and Thudium (O.S.Pa.) are firmly convinced that the Fothergill operation should be adopted as the standardized operation for the treatment of genital prolapse. They describe and illustrate this operation. Laws (O.S.Pa.) is of the opinion that the majority of cases of genital prolapse after the menopause are best treated by vaginal operations including subvesical interposition and the Mayo vaginal hysterectomy.

Koenig (F.C.G.) favors the Halban operation for prolapse of the uterus, whereas Labhardt (F.C.G.) recommends subtotal colpoperineocleisis under local anesthesia. The latter author prefers this type of almost complete closure of the vagina to the LeFort operation because in several cases incontinence of the bladder followed the Le Fort operation.

Buermann (A.M.A.) and Masson (A.M.A.) discussed the symptoms, diagnosis and treatment of vaginal enterocele or true vaginal hernia. The former author found that 86 of these cases were reported in the literature including three of his own. Masson reported that 16 of these cases were seen at The Mayo Clinic.

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#### SOCIETIES

1. A.A.O.G. & A.S., American Association of Obstetricians, Gynecologists and Abdominal Surgeons
2. A.C.S., American College of Surgeons
3. A.G.S., American Gynecological Society
4. A.M.A., Section on Obstetrics and Gynecology and Abdominal Surgery, American Medical Association

5. A.M.N.N.J., Section of Obstetrics and Gynecology, Academy of Medicine, Northern New Jersey
6. A.S.R.A.N.Y.A.M., American Society Regional Anesthesia, New York Academy of Medicine
7. B.G.O.S., Berlin Gynecological and Obstetrical Society
8. B.G.S., Brooklyn Gynecological Society
9. B.M.A., Section on Obstetrics and Gynecology, British Medical Association
10. B.O.S., Boston Obstetrical Society
11. B.S.G.O., Belgian Society of Gynecology and Obstetrics
12. C.A.O.G., Central Association of Obstetricians & Gynecologists
13. C.C.St.L.C., Clinical Conference of the St. Louis Clinics
14. C.G.S., Chicago Gynecological Society
15. D.G.S., Dresden Gynecological Society
16. D.O.G.S., Detroit Obstetrical and Gynecological Society
17. E.O.S., Edinburgh Obstetrical Society
18. F.A.M., French Academy of Medicine
19. F.C.G., French Congress of Gynecology
20. G.G.S., German Gynecological Society
21. G.R.S., German Roentgen Society
22. G.S.G.S., Gynecological Society of German Switzerland
23. G.S.H.M.S., Gynecological Section of Hungarian Medical Society
24. I.M.S., Illinois Medical Society
25. K.G.S., Kinki Gynecological Society (Japan)
26. L.A.O.S., Los Angeles Obstetrical Society
27. M.M.S., Section of Obstetrics and Gynecology, Massachusetts Medical Society
28. M.R.O.G.S., Middle Rhine Obstetrical and Gynecological Society
29. M.S.C.M.S., Memphis and Shelby County Medical Society
30. N.E.G.G.S., North East German Gynecological Society
31. N.E.O.G.S., North of England Obstetrical and Gynecological Society
32. N.M.S.M., Neisserman Medical Society of Massachusetts
33. N.Y.A.M., Section on Obstetrics and Gynecology, New York Academy of Medicine
34. N.Y.O.S., New York Obstetrical Society
35. N.W.G.G.S., Northwest German Gynecological Society
36. O, Paper not presented before a medical society
37. O.P.M.S., Orleans Parish Medical Society
38. O.S.Pa., Obstetrical Society of Philadelphia
39. P.O. & G.S., Paris Obstetrical and Gynecological Society
40. P.M.S.S., Pavia Medical and Surgical Society (Italy)
41. P.S.O.G., Portland Society of Obstetricians and Gynecologists
42. R.H.M.S., Gynecological Section of Royal Hungarian Medical Society
43. R.S.M., Section Obstetrics and Gynecology, Royal Society of Medicine
44. St.L.G.S., St. Louis Gynecological Society
45. S.E.G.S.O.G., South East German Society of Obstetrics and Gynecology
46. S.G.S., Swiss Gynecological Society
47. S.M.A., Section on Obstetrics, Southern Medical Association
48. S.O.G.S., Strasburg Obstetrical and Gynecological Society
49. T.O.G.S., Toscanney Obstetrical and Gynecological Society (Italy)
50. U.R.O.G.S., Upper Rhine Obstetrical and Gynecological Society
51. V.O.G.S., Vienna Obstetrical and Gynecological Society



# Item

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## American Board of Obstetrics and Gynecology

The next written examination and review of case histories for certification by the American Board of Obstetrics and Gynecology will be held, according to location of applicants, in various cities of the United States and Canada, on Saturday, December 9, 1933, at 2 P.M. For application blanks and further details, address, Paul Titus, M.D., Secretary, 1015 Highland Building, Pittsburgh, Pennsylvania.

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de Snoo, K.: The Significance of Preventive Obstetrics for Mother and Child. *Monatschr. f. Geburtsh. u. Gynäk.* 91: 1, 1932.

During the years 1928, 1929 and 1930, 5432 obstetric patients registered in de Snoo's clinic in Utrecht. These women were seen on an average of 4.7 times during pregnancy. Of the 465 women who were admitted to the hospital before delivery mostly for social reasons, contracted pelves and toxemia, two died undelivered (abruptio placentae and heart failure), and five died after labor (embolus 2, pneumonia 1, postpartum hemorrhage 1, and apoplexy 1). Of the 4969 delivered at home 3 died (sepsis 2, pulmonary tuberculosis 1). The total mortality therefore including abortions is 12 in 6012 cases or 0.2 per cent. Without abortions the mortality was 0.18 per cent. The mortality in the 465 hospital cases was 1.5 per cent and in the 4969 home cases it was only 0.06 per cent. The frequency of forceps delivery was 2 per cent, of breech extraction 0.7 per cent, of version and extraction 0.23 per cent and of cesarean section only 0.07 per cent.

Of the 6010 children, 85.8 per cent were full term, 3.7 per cent were premature and 10.6 per cent were immature or abortions. The fetal death rate for the full-term children was 1.5 per cent and for the premature babies it was 27 per cent. The total mortality for the viable children was 2.3 per cent.

The author is satisfied with his results except in cases of placenta previa. He has tried out various procedures and now favors the use of a colpeurynter because it is the least harmful for the mother.

The mortality from puerperal sepsis in Holland is 0.7 per cent. In Rotterdam among 21,533 obstetric patients delivered by midwives there were only 14 deaths due to puerperal sepsis. The midwives are not permitted to give any uterine stimulants or narcotics. They are taught to correct malpresentations, to examine the urine and to take the patient's blood pressure regularly. They can be trusted to use antisepsis and asepsis and they recognize the dangers of conveying infection from infected women to healthy gravidæ. Sixty per cent of all deliveries are performed by midwives.

J. P. GREENHILL.

# American Journal of Obstetrics and Gynecology

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## Original Communications

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### RECENT ADVANCES IN THE STUDY OF THE ETIOLOGY AND TREATMENT OF ECLAMPSIA GRAVIDARUM\*

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ALTHOUGH a vast amount of conscientious work has been done in its sphere, eclampsia still maintains much of its sphinxlike mystery. Further progress in the present situation is dependent on knowledge drawn from the general body of the basic sciences, experimental physiology, biochemistry, pharmacology. It is fully realized by modern medicine that the mechanism of abnormal phenomena observed in diseased subjects must be interpreted in terms of altered organic function; that working on incipient stages of disease is largely preferable to investigating end-problems; and, finally, that progress in one branch of science is furthered by the reflection upon its problems of knowledge gained in another field. Thus, for constructive advance in the elucidation of the profound derangements of general metabolism incidental to the late toxemias of pregnancy it is essential to understand more definitely the gestational alterations of those organs which govern metabolic processes. Inasmuch as the liver represents the largest and most important of such organs, acquaintance with its structural and functional conditions in normal pregnant women represents an integral part of the information indispensable in this domain.

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\*Presented at the University of Chicago, October 6, 1932.

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NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

## FUNCTIONAL ACTIVITY OF THE LIVER IN THE PREGNANT WOMAN

The subject of liver function during normal gestation is one that has caused an endless chain of argument ever since the present writer (in 1908) had coined the term "Liver of Pregnancy" to embrace certain deviations from the normal in the histology and function of the liver during the latter half of pregnancy. *Glycogen deficiency* of the central parts of the liver lobules and certain associated functional disorders of metabolism constituted the principal features of this new concept.

In order to clarify the confusing situation with reference to liver function in pregnancy, which, for years, has been the occasion of much fierce controversy, a study was made in this Department on forty normal pregnant women, using v. Bergmann's method, as modified by Harrop and Barron. v. Bergmann and his associates have made use of the bilirubin excretory power of the liver in extensive investigations on a variety of hepatic derangements by injecting intravenously synthetic bilirubin (1 mg. per kilogram of body weight, dissolved in 15 c.c. of 0.5 per cent  $\text{Na}_2\text{CO}_3$ ). In normal individuals, bilirubin injected at this concentration is totally excreted within two to four hours, four hours being the maximum limit. Bilirubin retention at the end of four hours reveals impairment of the power of the liver to excrete the pigment. Several investigators who have availed themselves of this method now consider the bilirubin excretory power the most delicate method thus far devised for testing the functional capacity of this organ. They claim that for the study of hepatic disorders body-foreign dyes should be discarded and only endogenous products (bilirubin) should be used.

Bilirubin (1 mg. per kilogram of body weight, dissolved in 15 c.c. of a 1/10 M solution of  $\text{Na}_2\text{CO}_3$ ) was administered intravenously to pregnant women of our service by Dr. L. J. Soffer of the Chemical Division of the Medical Clinic of the Johns Hopkins Hospital, to whom we owe a debt of gratitude for his bilirubin determinations and also for the privilege of communicating the results thus far obtained; they will be published by him in more detail on another occasion. Determinations of the bilirubin content of the blood were made prior to the injection, five minutes after the injection, and again after four hours. It was of great interest to see that in 20 cases of early pregnancy (up to the fifth lunar month, inclusive), normal figures were invariably obtained, while in the second half of pregnancy a remarkable retention of bilirubin was found in a comparatively large number of cases. Taking the generally accepted view that a retention of 10 per cent or more after four hours signifies definite liver damage, we reach the conclusion that during the second half of gestation 40 per cent of all pregnant women sustain actual functional deficiency of the liver.

The results obtained in this study are given in Table I.

TABLE I

Bilirubin retention after 4 hr. (in %)	11.1	23.1	11.5	5.4	9.0	15.1	13.5	7.3	7.6	2
Lunar month of pregnancy	VI	VI	VI	VII-VIII	VIII	VIII	IX-X	IX	IX-X	X
Bilirubin retention after 4 hr. (in %)	6.0	5.2	12.9	0	7.2	0	8.2	7.3	12.1	12
Lunar month of pregnancy	VIII	VII	VII	VIII	VII	VI	IX	VIII	VIII	VIII

Investigations conducted along similar lines have recently been published by C. Kaufmann. In a series of normal pregnant women the levulose tolerance method was employed in addition to the v. Bergmann test, and the degree of the initial hyperglycemic response to the intravenous administration of commercial insulin was also determined. Retardation of the elimination of injected bilirubin was encountered in 40 per cent of his cases in the second half of pregnancy, while disturbances of carbohydrate metabolism occurred in 45 per cent of this series. The author concludes by saying that the figures obtained point to a definite derangement of liver function during the second half of gestation. Nürnberger recently reached the same conclusion.

In searching for the causative agents of liver damage in the pregnant woman, one must remember that recent clinical and experimental studies have established the fact that passive congestion of the liver, degradation of endogenous proteins, and ferments place an undue strain on the liver which ultimately results in a deficiency of the metabolism of carbohydrates and of bile pigment. Thus, following extensive traumatism of the tissues during operation or as a consequence of *prolonged* injections of foreign proteins, impairment of liver function associated with glycogen deficiency is readily demonstrable (Bergmann, Stroebe, Kaufmann and Knittel, and others). In the light of these fundamental facts we would recall the passive congestion which is an essential feature of the histologic picture during gestation. What is more significant is the well-established fact that at all periods of pregnancy varying amounts of syncytial buds, fetal ectoderm, are constantly being cast off from the large area of the chorionic villi, whose exposed surfaces equal at term 6.5 square meters.<sup>6</sup> Such syncytial substances eventually break down and dissolve in the maternal blood within the intervillous spaces. It is readily understandable, therefore, that the *pregnant organism* should be viewed as being under the constant influence of blood foreign proteins.

In this connection, we must remember that for the economy of the gravid organism the process of discharge of fetal elements from

<sup>6</sup>See photomicrograph in my article on Histamin Intoxication, AM. J. OBST. AND GYNEC. 12: p. 186, 1926.

the periphery of the ovum represents an important biologic device. According to the experimental studies of Berblinger and others, such proteins serve as messengers to the anterior pituitary, the thyroid and the cortex of the adrenals, which structures respond to this stimulus by hyperplasia and hypertrophy, changes recognized as essential phenomena incident to normal pregnancy. On the other hand, the constant process of transmission into the maternal blood stream of syncytial proteins and ferments first stimulates the functional activity of the liver (particularly the Kupffer cells), while in the course of time a certain degree of hepatic insufficiency ensues, as established by the studies of Chiron and Scandura, among others. It should be remembered, at this juncture, that the Kupffer cells lining the hepatic sinusoids represent a protecting barrière in that, by virtue of their histiocytic properties, they engulf particulate matter, ferments, body-foreign, and endogenous poisonous substances.

The increased permeability of the capillaries during the last few weeks of pregnancy, as established by the researches of Heynemann, Hinselmann, Benda, and others, is also traceable to placental protein split products. It is worthy of note that endothelial permeability is more pronounced in primigravidas than in plurigravidas and reaches its high-water mark during labor (Benda).

Armed with these facts, we can proceed to consider the bearing of altered liver and capillary function during pregnancy on the activity of the products of certain glands of internal secretion. The marked ability of the liver to destroy or to inactivate highly toxic alkaloids has been the subject of considerable study for many years. Increased susceptibility to toxic agents has been observed in animals with reduced amount of hepatic tissue, while Priestley and Mann demonstrated the remarkable ability of the liver to destroy nicotine, strychnine, tyramine, and atropine. The researches of Priestley and Falta, Trendelenburg, and others, supplied abundant evidence to show that in the destruction of *adrenalin* in the animal organism the liver plays the predominant part. Haynal, in corroboration of these results, recently found that in the ordinary Eck-fistula dog the blood pressure responses to adrenalin are normal; but, when the blood passes through the liver in reversed Eck-fistula dogs, the pressor response is almost abolished. The process of absorption or inactivation of the *pressor principle of the posterior pituitary* has recently been brought into association with the activity of the *liver* and of the *capillaries* by the researches of Haynal, Knaus, Hartmann, and Trendelenburg. *Thyroxine* is retained or altered and modified in some way in the liver, so that a relatively smaller dose is passed on to the systemic circulation (J. McMichel).

Realization of the facts just detailed makes it evident that impairment of liver function and altered physiology of the capillaries may have

a distinct bearing on the presence in the blood of certain pregnant women of *potent hormones*.

## HYPERPITUITARISM IN ECLAMPSIA

On the basis of certain clinical and blood findings, hyperfunctioning of the postpituitary in eclampsia and preeclampsia has been suggested by me (in 1918). Ehrhardt and Küstner, in 1927, reported the finding of the melanophore-expanding principle in the blood and in the placentas of eclamptic women. Recently, Dietel found the melanophore-expanding principle in abundance in the serum of eclamptics, and described hepatic and renal hemorrhagic lesions in laboratory animals which had been repeatedly injected with commercial pituitary extracts. In a fascinating study, Kennedy, Hoffmann and Anselmino succeeded in isolating from the blood of 19 eclamptic women both the antidiuretic and the pressor substance of the posterior pituitary, as evidenced by their effects on rabbits. It was a highly interesting feature of this study that the amount of the pituitary principles found in the serum of eclamptics varied with the severity of the condition of the individual patient. These authors also demonstrated the presence of the thyroid hormone in the blood of eclamptics, thus substantiating earlier findings of Eufinger and Wiesbader.

The striking similarity between the cardinal features of blood chemistry in eclampsia and those of experimental hyperpituitarism is too obvious to be ignored. Following the intravenous administration of various postpituitary preparations to unanesthetized dogs, remarkable phenomena take place which closely parallel the conditions found in actual eclampsia and preeclampsia. Consideration of the data obtained in these experimental studies reveals the occurrence of hyperglycemia, increased formation of lactic acid, considerable lowering of the  $\text{CO}_2$ -combining power of the blood, and increase in inorganic phosphates. As an obvious parallel, uncompensated acidosis, hyperglycemia, and increase in lactic acid and in inorganic phosphorus are well-established biochemical phenomena in eclamptic women. One further point merits special attention. According to recent experimental studies, pituitary extracts interfere in some unknown manner with the utilization of oxygen by the tissues (Grollman, Himwich, Geiling). The cells thus become anaerobic in their activity and go into an oxygen debt, as evidenced by the fact that the arteriovenous difference is markedly reduced. This reflection of lowered oxygen consumption by the tissues under the experimental conditions mentioned is analogous to data found in actual eclampsia. The researches of Mahnert have established the fact that in eclamptic women the venous blood, in addition to having a markedly reduced  $\text{CO}_2$ -combining power, is characterized, prior to and also following the convulsions,

by a reduction of its carbon dioxide content. In these studies, the lowest values of carbon dioxide content of the venous blood were obtained in the severe cases of eclampsia, and emphasis was placed upon the realization that this condition is conducive to an accumulation of catabolites, particularly lactic acid. The studies of Zange-meister, Falk and Hesky, Hasselbalch and Gammeltoft, Klasten, Rodenacker, and others, also clearly show that depression of tissue oxidation, an effect comparable to anoxemia, represents an essential feature of the metabolic derangement in the eclamptic and preeclamptic states. According to the studies of Rodenacker, decrease of the oxidative power of the tissues to the level of internal asphyxia represents the determining factor in eclampsia; it is principally this phenomenon which should be regarded as the keystone to the interpretation of certain remarkable phenomena occurring in vital organs of eclamptic patients. Another interesting phenomenon has been established by the recent studies of Rossenbeek. In conformity with the observations made by Gollwitz-Meier that, as the result of the intravenous injection of posterior pituitary extract, a process of crowding out of Na-ions from the blood into the liver, the cortex of the brain and the striated muscles is demonstrable, this investigator encountered the same conditions in several cases of eclampsia. Furthermore, polycythemia decrease of the calcium content of the blood and the raised threshold of the striated muscles to the galvanic current after intravenous administration of postpituitary extracts (Cushing, Leucher, Yoshimoto) find their counterpart in similar conditions in eclamptics (Spiegler).

Identification of the changes which are known to occur in vital organs of eclamptic and preeclamptic patients by two closely interwoven methods, clinical observation and experimental approach, will serve a useful purpose by supplying a necessary link, indispensable to the integrity of the chain of our reasoning. Acquiescence in the conception advanced above, with the possibility which it affords of interpreting the well-known clinical and anatomical phenomena in the heart, the kidney, the brain and the liver of eclamptic patients in terms of hyperpituitarism, will allow of looking at the matter more broadly and collectively.

At the outset, it should be remembered that the readiness to constriction of the arterioles in various systems as a response to the pressor principle of the pituitary is enhanced by the presence in the blood of eclamptics of an excess of the thyroid hormone, which increases the responsiveness of the vasomotor centers. In unanesthetized dogs, pituitary extract produces constriction of the coronary arteries and inhibits oxidative processes in the *myocardium*, as it does in skeletal muscle (Grollman, Rothberger). Decrease in the minute-volume output of the heart, changes in the electrocardiogram, and degenerative changes and dilatation of the heart ensue, in addition to the indirect

results of peripheral vasoconstriction. Precordial pain, a significant clinical symptom in preeclamptic conditions, is referable to spasmodic contractions of the coronary arteries. Degenerative changes of the myocardium and dilatation of the heart, known to occur after eclamptic attacks, entail an element of grave danger, particularly in individuals affected with hypoplasia of the heart, as established by the extensive studies of Hermann and Klasten. It is important, from the clinical point of view, that morphine and hypertonic solution of glucose counteract the effect of pituitary extract on the coronary arteries. It is also worthy of note that J. Young, in a recent communication concerning data obtained in the postnatal clinic of Edinburgh, reports the persistence of raised blood pressure and of cardiac lesions in the nature of dilatation and degenerative changes of the myocardium in 30 per cent of cases which had previously been treated for eclampsia.

The antidiuretic effect of the posterior pituitary hormone, oxygen lack and the decreased blood flow through the *kidney* (Richards) as the result of angiospasm account for the diminished urinary output and for the occurrence of degenerative changes, particularly endothelial damage, in the renal parenchyma of eclamptic patients. Injury of the glomerular capillaries represents the essential feature of the picture.

For a critical evaluation of the pituitary effect on the *brain* the recent experimental work of Keith, Friedemann, Barbour, and Leimdoerfer is worthy of consideration. It was shown that, following the injection of posterior pituitary extract into the cerebrospinal fluid, there occurs a considerable rise, of long duration, of blood pressure, resulting from a stimulation of the cerebral vasomotor centers (Leimdoerfer). The cerebral arteries respond to the sudden elevation of blood pressure by constriction (Starling) which produces cerebral anemia. Oxygen starvation excites the flow of adrenalin into the blood current and, also, rapidly increases the permeability of the capillary walls, thus favoring perivascular exudation, edema of the brain and increased intracranial pressure (Bayliss). In addition, owing to the great dependence of the nerve and of the capillary endothelial cells upon an abundant supply of oxygen, degenerative changes of vital nerve centers, due to angiospasm and punctate hemorrhages in the brain may develop. Edema of the brain has recently been produced in experimental animals by the administration of pitressin (Balfour). Of prime importance is the recent demonstration by Keith and by Friedemann that pituitrin and pitressin produce a remarkable effect in increasing the permeability of the cerebral cortex to the entrance of narcotics and convulsant drugs. Following the administration of pitressin, a fifth of the minimal convulsing dose of strychnine, thujone produced severe convulsions. This did not



occur in the controls. Pitressin and adrenalin also eliminated entirely the refractory period due to the administration of such drugs. The *retina* gives the obstetrician objective information as to the condition of the systemic arterioles, and more particularly the state of the cerebral arterioles. Intermittent vasospastic phenomena of the retinal vessels, with or without perivascular exudation, are common occurrences in eclampsia and preeclampsia. If the angiospasm persists for a longer period of time, retinitis or detachment of the retina may result. (Wagener.)

Experiments conducted with Warburg's method indicate that the addition of posterior pituitary to *liver* tissue is conducive to anoxemia (Pincus). Inhibition of oxidation, on the other hand, is recognized as having an injurious effect upon living cells, particularly those of the *liver* (Barcroft). The precipitous decrease in the oxygen consumption produced by the pressor principle of the pituitary primarily affects the peripheral cells of the liver lobule. Under such conditions, glycogen disappears and autolysis occurs in these areas, bringing in its train the deleterious effect of histamine-like substances on the liver. In a previous paper has been presented evidence that in acute histamine poisoning there occurs, in discrete places in the periphery of the liver lobules, a process of necrosis which is attended by edema and at times by hemorrhage in the periportal spaces. Our observations have, of late, been substantiated by Louros, and by Dieckmann. It should be noted that, consequent upon such reduction in the amount of normal hepatic tissue, the functional capacity of the liver to destroy toxic substances (tyramine) and to inactivate pituitrin is further diminished. In other words, the autolytic process initiated by want of oxygen favors the development of focal necrosis, and a vicious cycle is induced by the coincident vascular phenomena, constriction of the ramifications of the hepatic artery and the portal vein occurring as a response to pituitary, and the constriction of the hepatic veins in response to histamine-like substances and to tyramine (Dale); while hemorrhage is due to both the resulting venous engorgement and the damage of the endothelium, the latter resulting from its deprivation of oxygen. Endothelial damage also accounts for the occurrence of thrombosis in the venules. Hence, the complexity inherent in the conditions of the liver in eclampsia is dependent upon a *combination of events* and not upon a single factor. That is to say, the interaction of immediate and remote causes must be considered in interpreting the wide range of hepatic structural changes seen in eclampsia and preeclampsia, irrespective of the occurrence or absence of generalized convulsions. Many pathologists, notably Pick, deny that the lesions generally described as characteristic, are limited to the periportal areas, but maintain that these changes may be found in any part of the liver of eclamptics. In support of this concept we may quote the

observations of Kosmak, and also the recent investigations of Davidson and Acosta-Sison who emphasize that the actual changes encountered in the livers of eclamptic women lack immutable features and are subject to considerable variation. These writers have been unable to demonstrate any consistent changes and stress the frequent occurrence of central and mid-zonal liver necrosis. In rare cases they have found no gross hepatic lesions, but small foci of necrosis and fatty degeneration of liver cells indistinctly scattered through the lobules. Similar pathologic findings were seen in all the clinical varieties of severe toxemia of pregnancy.

In the light of the experimental evidence that prolonged spasm of the umbilical vessels can be readily elicited by histamine, the origin of *placental* infarcts, particularly of the hemorrhagic type, frequently encountered in placentas of preeclamptic and eclamptic patients is readily traceable to such substances passing through the placental

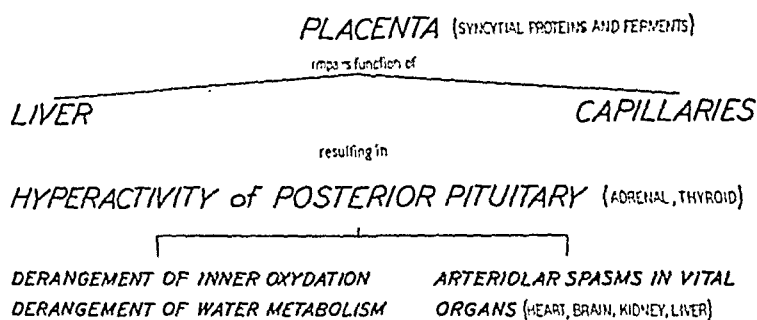


Fig. 1

barrier. In other words, placental pathology in eclampsia has the same pathogenesis as the abnormalities found in other organs and should not be considered as having causal relations to the toxemia of pregnancy.

In conclusion, to forestall criticism, we emphasize that since the composition of the postpituitary hormone is not yet known any attempt at the unequivocal demonstration of the identity of eclampsia and hyperpituitarism is bound to be subject to certain limitations. The nature of the biologic, chemical, clinical, and anatomic data presented above, however, is such that this identity strongly suggests itself. It is gratifying to notice that in support of our contention, Harvey Cushing quite recently reported before the Academy of Sciences his findings in eclamptics of "massive basophilic invasion of the posterior lobe of the hypophysis by basophilic elements, the secretory product of which can be traced in favorably fixed tissues up the pituitary stalk to the region of the tuberal nuclei. Such stimulation of the tuber causes (Karplus) a postpituitary substance to appear in the cerebrospinal fluid." (Proc. Soc. Exper. Biol. and Med. 30: No. 9, 1933.) From a state of vague uncertainty and mystery, the problem of eclampsia now ascends to a level of associated facts.

Our analysis of the pathogenesis of eclampsia gravidarum resolves itself into a sequence of events of which Fig. 1 is representative.

#### THE ECLAMPTIC SEIZURE

Every type of the late toxemias of pregnancy may eventuate in generalized convulsions. A careful assessment by Elsberg, Lennox and Cobb, and Fay of factors which influence the susceptibility of the brain to initiate motor discharges, "the convulsive capacity," has determined those fundamental physicochemical processes which, in a general way, condition material interference with the metabolism of the brain and, thus, conduce to convulsions. Among them, oxygen lack, increased permeability of the meninges and the choroid plexus, cerebral hydration and increased intracranial pressure, alkalosis rank first. With these predisposing factors is associated in eclamptics a state of increased irritability of the autonomic nervous system, in response to an excess in the blood of the thyroid hormone and to protein sensitization. Impulses from the sympathetic system (uterine contractions) or external sensory stimuli may act as the precipitating factors of attacks of vasospasm of the cerebral arterioles, with ensuing generalized convulsions.

Through an alteration of the osmotic pressure of the tissues, an excess of posterior pituitary favors water retention (Ellinger). A positive water balance above a certain magnitude in connection with an oversupply of posterior pituitary has been closely identified, in recent years (McQuarrie, Gamble, Fay, Lennox and Cobb), with the etiologic factors of convulsive seizures, incident to a variety of conditions.

As to alkalosis, we remember the data recorded above, that both in actual eclampsia and in experimental hyperpituitarism, there occurs in the cortex of the brain a remarkable oversupply of Na-ions, i.e., local alkalosis.

Finally, reference to the analysis of the pathogenesis of eclampsia and its precursors, as presented above, may give us a clue as to why eclampsia is more common in twin than in single pregnancy (larger surface of the placenta), why eclampsia never occurs in the first half of pregnancy, and why primiparas are more often affected than multiparas.

#### THERAPEUTIC ASPECTS

With a better understanding of the basic processes which underlie the manifestations of eclampsia, and with the consequent dissociation of cause and effect among the phenomena observed, advancement from empiricism to concerted efforts toward correcting the condition, by profitable application of new data, is giving indications of clinical usefulness.

Considering that the serious manifestations of eclampsia have their origin in (a) derangement of oxidative processes, (b) derangement

of water metabolism culminating in cerebral edema, and (c) effects of vasospasm in vital organs, the practical aim to be approximated is:

First, to counteract and relieve these phenomena.

Second, to destroy, if possible, the hormonal principles involved, or to counterbalance their action.

Third, to maintain, or increase, if possible, the reduced reserve of vital organs.

*ad (a)* The importance of glucose to tissue oxidation has been well illustrated by the researches of Bollmann and Falta which tend to demonstrate that these processes depend, in a large measure, on the availability of sufficient amounts of glucose. In addition, a generous supply of oxygen, by inhalation, serves the same purpose.

*ad (b)* A dehydrating regimen, by strict limitation of fluid intake, intravenous administration of hypertonic glucose solution, and curtailment of the intake of food, has proved effective in eclamptic and preeclamptic patients. Particular emphasis has been placed on the therapeutic aspects of dehydration, of late, by Arnold and Fay; and I fully share the opinion expressed by Plass that the beneficial results of hypertonic glucose solutions are due to their "hypertonicity rather than to the fact that they contain glucose; they act in a purely physical way by increasing the osmotic pressure of the blood, drawing the fluid out of the tissues." Flooding the organism with calcium and magnesium salts has also been recognized as a means toward dehydration.

*ad (c)* The vasodilator effect of hypertonic glucose solution (20 per cent) has been established, both clinically and experimentally, by Handovsky and Meyer in cases of essential hypertension, while in chronic nephritis with this medication no dilator effect was noticeable. As stated above, hypertonic glucose and morphine serve to counterbalance the vasospastic effect of pituitary solution on the coronary arteries. (Schwab.)

The data recorded, along with the recognition of stimulation of the bone marrow, and of control of the vicious cycle occurring in the liver and in the heart by the intravenous administration of hypertonic glucose, lent themselves to the synthesis that the procedure in point may be regarded as an essential improvement in the therapeutic regimen of eclamptic patients. Contrary to what has been suggested by others, I advocate the administration of 250 c.c. of a 20 per cent solution of glucose following the withdrawal of 300 to 350 c.c. of blood, the procedure to be repeated at six-hour intervals if necessary.

The condition of the heart in eclamptic patients demands most careful attention. Prenatal care, with particular emphasis upon the diet, which should avoid undue strain on the liver (excess of meat, fats, salt, etc.), and upon regularity of bowel movements, is a matter of no small significance.

In view of the fact that it has become recognized that the principles of the posterior pituitary gland may be destroyed in a weakly alkaline medium or by ultraviolet rays, treatment of eclamptic or preeclamptic conditions with *alkali* and ultraviolet rays evidently represents an essential factor in our therapeutic armamentarium. The gratifying re-

sults obtained in certain institutions by the routine employment of certain empirical methods become, thus, explicable on scientific grounds. The "Dublin method," originated in the Rotunda Hospital, comprises: Starvation, colonic lavage with water containing 1 gm. of sodium bicarbonate to the pint and allowing one or two pints of this solution to remain in the bowel, infusion of 1000 c.c. of sodium bicarbonate under the breasts, stomach lavage and pouring down into the stomach three ounces of sodium bicarbonate or magnesium sulphate solution. The rationale of this procedure, as a change in the internal environments of the organism, is obvious in the light of the foregoing considerations and of the recent studies of Katsch, who showed that prolonged withdrawal of gastric juice markedly changes the acid-base equilibrium of the serum toward the alkaline side and, in certain instances, tends to lower abnormally high blood pressure. *The routine administration to eclamptics and preeclamptics of alkali represents an integral element in the etiologic treatment of the condition, not with a view of combating acidosis, which very rarely reaches the degree of incompatibility with life, but for changing the "milieu" of the organism.* Moreover, basing their claims on experiences covering a large number of preeclamptic and eclamptic patients, Hoehenbichler, Mayer, and Kermauner emphasize the beneficial effect of a repeated application of ultraviolet rays for the relief of hypertension and vasospasm in eclamptic and preeclamptic women. Impairment of the oxidative processes in the tissues, a fundamental factor in the pathology of eclampsia and its antecedents, was also materially relieved, if not obliterated, by this procedure. The clinical observation that eclamptic convulsions exhibit seasonal variations and are more apt to occur when the weather is damp and the sky cloudy is explained by these writers as being due to the reduction in efficiency of the sun's rays and the altered conditions of the circulation through the body's surface.

Inhibition of the oxidative process in eclamptics affords a biochemical basis for the institution of a liberal administration of oxygen to such patients, as recommended by me years ago.

The favorable results obtained in the palliative treatment of eclampsia with sedatives (morphine, chloral hydrate, luminal, magnesium sulphate) clearly substantiate the experience of prominent pharmacologists that the posterior pituitary effects are readily controllable by these drugs (Trendelenburg, and others). Such sedatives also materially decrease the excitability of the autonomic centers.

The importance of the integrity of liver function in its bearing on surgical risk, occurrence of shock, safety of various types of anesthesia, has, of late, been investigated on a large scale by Rehn, Henschen, The Mayo Clinic, and others. The inferences drawn by these writers, namely, that in abdominal and pelvic surgery, in the face of deranged function of the liver a minimum of traumatism to the tissues, curtailment of anes-

thetics and administration of glucose represent important prophylactic measures, have been conclusively borne out by clinical experience. Consequently, delivery by the least possible violence is the keystone to success in delivering eclamptic and preeclamptic patients. Conservative treatment is the more desirable since these patients possess a lowered tolerance to infection, in consequence of impairment of function of their hepatic defensive mechanism. These views fully explain the appalling observations which have been formerly made on eclamptic women who have been subjected to extensive operations (*accouchement forcé*, etc.); they also justify the preference generally given the conservative over the radical treatment in eclampsia.

The use of commercial preparations of posterior pituitary for the stimulation of uterine contractions during or after labor is *contraindicated* in preeclamptic and eclamptic conditions. We have witnessed the outbreak of violent eclamptic seizures, attended with anuria for thirty-six hours, following the injudicious use of pituitrin in hypertensive, edematous parturients. Similar observations are on record in the literature on the subject. Experiences of this nature led to the abolition, in this department, of the use of ordinary pituitary preparations in preeclamptic and eclamptic patients, while oxytocin may be used with impunity.

## REFERENCES

- Hofbauer*: Ztschr. f. Geburtsh. u. Gynäk. 61: Arch. f. Gynäk. 93: 405, 1911; Zentralbl. f. Gynäk. 1918; AM. J. OBST. & GYNEC. 12: 159, 1926, and 17: 603, 761, 1929. *Bergmann*: Deutsche med. Wchnschr. No. 47, 1931. *Soffer*: Johns Hopkins Bulletin, 1933. *Benda*: Arch. f. Gynäk. 125: 1925; Zentralbl. f. Gynäk. 1: 1927. *Grollman*: J. Pharmacol. 46: 447, 1932. *Rodenacker*: Zentralbl. f. Gynäk. No. 23, 1927. *Mahnert*: Arch. f. Gynäk. 119: 1923. *Anselmino, Hoffmann, and Kennedy*: Edinb. Med. J. 39: 1932. *Keith*: Arch. Psych. and Neurol. 1933. *Friedemann*: Deutsche med. Wchnschr. No. 24, 1932. *Arnold and Fay*: Surg. Gynec. Obst. 55: 129, 1932. *Rehn*: Klin. Wchnschr. No. 13, 1932. *Hartmann*: Arch. exp. Pharm. 154: 254, 1930. *Abelin*: Biochem. Ztschr. 228: 1930. *Nürnberg*: Arch. f. Gynäk. 153: 1933. *Schwab*: Ztschr. f. exp. Med. 67: 1929. *Wagener*: Ann. Int. Med. 1930. For complete bibliography see: *Hofbauer*: Zentralbl. f. Gynäk. No. 1, 1933, and Klin. Wchnschr. 1933. *Trendelenburg*: Die Hormone, 1931.

## INDUCTION OF LABOR BY MEANS OF ARTIFICIAL RUPTURE OF MEMBRANES, CASTOR OIL AND QUININE, AND NASAL PITUITRIN

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**I**N 1929 a series was started at the University of California Hospital by the above method and continued over a period of two years. One hundred and fifty inductions were attempted with such striking results that it seemed incumbent upon us to report them. It must be

understood that there were by no means 150 bona fide indications for inducing labor during this two-year period. The inductions were attempted to test the efficacy of a method which might be useful in inaugurating labor in women with toxemia of pregnancy, who, under previously existing conditions, would have been delivered by cesarean section. Therefore, attempting to induce labor only under most favorable conditions, we restricted our cases to those at or near term, who had normal pelves, and engagement of the presenting part. These circumstances naturally militated in favor of the method and must be taken into consideration in our judgment of the results. The indications are listed below:

Experimental	122
Toxemia	21
Past term	6
Twins	1
Total	<hr/> 150

*Procedure.*—The detail of the method was similar to that employed by Guttmacher and Douglas. A sample of this routine is as follows:

4:00 A.M.	Castor oil	30.0 c.c.
5:00 A.M.	Quinine	0.3 gm.
6:00 A.M.	Quinine	0.3 gm.
7:00 A.M.	Quinine	0.3 gm.
7:30 A.M.	Hot S.S. enema	
8:30 A.M.	Artificial rupture of the membranes	

Rupture of the membranes was accomplished after placing the patient in the lithotomy position, scrubbing and preparing the vulva as for delivery, and injecting 30 c.c. of 4 per cent aqueous mercurochrome into the vagina as recommended by Mayes.<sup>8</sup> The first two fingers of the right hand were inserted into the vagina to locate the cervix; either one or both were then inserted into the cervix until the membranes were encountered. The cervix was gently stretched when possible, and the membranes stripped from the region of the internal os. A long hook, similar to one blade of a disarticulated vulsellum tenaculum, especially constructed for the purpose, was then inserted into the vagina with the left hand, guided into the cervix by the fingers of the right hand. The membranes were simply hooked or punctured with the sharp end of the instrument. Anesthesia was not necessary. In this series of 150 cases, some difficulty was encountered in 25, but never sufficiently great to prevent accomplishment of the rupture. The cervix was described as being inaccessible 29 times, usually because it was long and posteriorly placed. The majority of difficulties came in these cases.

After rupturing the membranes, pituitrin was given intranasally every hour until good pains set in. Minor variations in this routine did not affect the results and are not considered.

*Efficacy of Method.*—The method was tried in 150 cases. One hundred and forty-eight were successful. There were 2 failures. The series was composed of 117 primiparas and 33 multiparas; a failure occurred in each group.

*Failures.*—One occurred in a para 5-2, aged thirty-six, at term, normal pelvis and prenatal course. A history was later obtained that during her fourth labor, pains had constantly to be stimulated by intramuscular injections of pituitrin. After rupture of the membranes pains failed to ensue, though nasal pituitrin was given every hour all day, the following day. On the third day intramuscular injections of pituitrin, starting with minim doses and working up to 9 minims, were given at hourly intervals with no effect other than transient, ineffective pains. Two days later, signs of an intrapartum infection developed, elevated temperature, a chill, the draining of cloudy, odoriferous amniotic fluid, and an increase in the fetal heart rate. A medium-sized Voorhees bag was inserted, but was expelled after three hours, after which the pains ceased. Since delivery seemed indicated and the uterus was flaccid, a version and extraction was performed with surprising ease, delivering a living child. The patient's temperature reached 38.5° C. on the first, second, and fourth days of the puerperium, yet fell to normal on the seventh day. The patient and child left the hospital both in good condition on the eleventh day of the puerperium and her fourth afebrile day. The second failure occurred in a primipara. After several doses of pituitrin no pains had started; through error of an attendant, the medicine was discontinued and the patient returned to the ward. Labor was later inaugurated with castor oil and quinine, and terminated spontaneously and uneventfully.

*Type of Labor and Delivery.*—The amount of pituitrin necessary for the method is of interest. In multiparas, the average number of nasal applications (1 c.c. each) was 2.9; in primiparas, 3.2. If, during the early stages of labor, the pains were found to be flagging, infrequent and short, the pituitrin was continued until the contractions were again of good character. This is an important detail if the method is to be uniformly successful. The usual sequence of events was the onset of very severe, rather prolonged contractions which caused considerable pain. In no case was tetanic contraction of the uterus encountered. Secondary uterine atony necessitated the use of forceps in a number of cases. A very considerable molding of the fetal heads was frequently noted, the caputs giving testimony of the severity of the contractions. However, harmful effects upon the babies were notably absent. After labor had been successfully instituted, cases were conducted similarly to those of spontaneous onset, employing sedatives and analgesics as indicated.

TABLE I

TYPE OF DELIVERY	PRIMIPARA	MULTIPARA	TOTAL
Spontaneous	86	25	111
Low forceps	25	3	28
Midforceps	3	0	3
High forceps	0	1	1
Breech extractions	2	3	5
Total	116	32	148

The incidence of instrumental delivery was 21.6 per cent. The majority of forceps operations were done on minor indications, such as prolongation of the second stage beyond one hour.



One point of interest presents itself; of 32 instrumental deliveries, ten were R.O.P. presentations. Of the 14 R.O.P. presentations, ten required forceps deliveries.

*Length of Labor.*—Induced labors were approximately only half as long as those which started spontaneously. In Table II is tabulated the average length of labor, from the onset of good pains through the second stage, as compared with the average for 766 cases occurring over the same two-year period in which labor started spontaneously. Also tabulated is the latent period (from rupture of membranes to the onset of good pains).

TABLE II

TYPE OF LABOR	PARITY	CASES	LATENT PERIOD	LENGTH LABOR
Labor	Primip.	116	1.81 hours	9.65 hours
Induced	Multip.	32	1.93 hours	3.93 hours
Onset of labor	Primip.	536		17.79 hours
Spontaneous	Multip.	230		10.59 hours

Feeling that averages are likely to be misleading, calculations were made for the most frequent duration of the labors. Such a procedure allows a better idea of the type of labor to expect. Labors of less than ten hours followed in approximately 65 per cent of primiparas induced by this method as compared with 35 per cent of primiparas whose labors started spontaneously. In regard to the multiparas, a still more striking comparison is possible; 75 per cent of multiparas delivered in less than five hours, 95 per cent in less than ten hours, when labor was induced by rupturing the membranes, as compared with 30 per cent and 65 per cent respectively for multiparas whose labors started spontaneously.

Selection of the majority of cases at or near term might have been responsible for the unusual degree of success. Attempt was made to obviate this difficulty by calculating the average duration of labor for cases in which the babies weighed less than 3000 gm. It was felt that baby weight is a better index of duration of pregnancy than the estimated duration in days, although it must be admitted that a number of such babies (weighing less than 3000 gm.) might represent instances of fully mature but small infants. The duration of labor for the actually premature infants (less than 2500 gm.) was also calculated.

TABLE III

WEIGHT	CASES		LATENT PERIOD		DURATION OF LABOR	
	PRIMIP.	MULTIP.	PRIMIP.	MULTIP.	PRIMIP.	MULTIP.
Less than 3000 gm.	23	7	1.81 hr.	2.29 hr.	7.88 hr.	3.70 hr.
Less than 2500 gm.	3	2	0.99 hr.	5.5 hr.	6.07 hr.	6.83 hr.

The number of cases is small, but the figures show that no unusual difficulty was encountered in inducing labor in patients with small

babies. The latent period and duration of labor did not vary markedly from the general average of the entire series.

*Factors Influencing Duration of Labor.*—The length and dilatation of the cervix, the degree of engagement of the head, whether the membranes were closely applied to the head or bulging, and the amount of fluid lost at rupture influenced to some extent the time required to induce labor and the subsequent duration of labor. Findings agreed in principle with those of Guttmacher and Douglas. The cases were roughly divided into three groups, those in which the cervical canal was found to be obliterated with the os 1, 2, or 3 cm. dilated; those in which the canal was partially obliterated and the os just open; and third, those in which the cervix was long and closed. The average latent period and average duration of labor were calculated for each group. The results show that the length of time required to induce labor and the length of labor became progressively longer the less the dilatation and obliteration of the cervix.

TABLE IV

CONDITION OF CERVIX	LATENT PERIOD		DURATION LABOR	
	MULTIP.	PRIMIP.	MULTIP.	PRIMIP.
Canal obliterated, os dilated, 1, 2, 3 cm.	0.5 hr.	1.03 hr.	2.18 hr.	6.26 hr.
Cervix partially obliterated, just open	1.06 hr.	1.56 hr.	3.72 hr.	7.01 hr.
Cervix long, closed	5.0 hr.	2.69 hr.	4.82 hr.	15.85 hr.

In regard to the other factors, analysis showed in general that engagement and fixation of the head favored a short induction and labor; that the results were slightly better if there was a moderate amount of forewaters.

*Morbidity.*—A rise in temperature above 38° C. was recorded during labor four times. In no instance was there a true intrapartum infection except in the multipara in whom the attempt to induce labor failed. Taking a rise in temperature to 38° C. on any two occasions in the puerperium as a standard of morbidity, 15 of the 148 patients successfully induced had febrile puerperia, an incidence of 10.1 per cent. There were no serious infections; indeed, the great majority were merely technical.

*Mortality.*—There were no maternal deaths. Three babies succumbed, an uncorrected fetal mortality of 2 per cent.

(1) Primipara had a prolonged labor. A stillborn child was delivered with forceps through cervix, the dilatation of which had been completed manually (cervix had been 7 to 8 cm. dilated for many hours without advance). (2) A 2650 gm. baby died on the third day of a colon bacillus infection, after having been delivered spontaneously in good condition following a seven-and-one-half-hour labor. (3)

Labor was induced before term for toxemia; after a seven-and-one-half-hour labor, a 1430 gm. baby was delivered in good condition. It died on its forty-second day of prematurity, weight 2500 gm. (autopsy did not reveal the cause of death).

*Accidents.*—The only real fetal complication was one prolapsed cord. This occurred in a multipara in whom the presenting part was not engaged. The possibility of prolapse was anticipated; the fetal heart rate was watched very carefully. When the drop in rate came, a living baby in good condition was delivered by high forceps.

There is distinct danger of this accident occurring when the presenting part is out of the pelvis at the time of rupturing the membranes. Induction of labor should not be attempted by this method under these circumstances, except on the most urgent indication, exercising great care when rupturing the membranes to see that the head and not the cord settles down against the cervix.

*Position.*—A variety of fetal positions was selected or encountered. Twins, breech, and posterior positions were included in order to cover as wide a range as possible. The tabulations (Table V) speak for themselves.

TABLE V

POSITION	MULTIPARA	PRIMIPARA	TOTAL
L.O.A.	18	60	78
R.O.A.	6	42	48
R.O.P.	4	10	14
L.O.P.	0	0	0
R.S.A.	3	0	3
L.S.A.	0	2	2
Twins	1	2	3
Totals	32	116	148

*Toxemia.*—Bona fide indications for induction of labor were furnished 21 times by toxemia of pregnancy. Since a group such as this contains cases representative of the type likely to demand induction of labor in actual practice, they are considered separately; it is more important to know what will happen in cases induced for specific reasons, regardless of duration of pregnancy, than in a group of cases selected because of their nearness to term and other favoring circumstances. The majority of the toxemias were mild; one patient developed eclampsia after labor had become well started. These cases included two pairs of twins and all except one of the five prematures. The average weight of the babies was 2975.6 gm. Fifteen of the twenty-one lacked an average of 12.13 days of being at term. Nineteen of the patients were primiparas, two were multiparas. The average latent period was 1.81 hours, the average duration of labor 7.4 hours.

In short, in this group of 21 cases in which labor was induced because of toxemia, labor followed rupture of the membranes in a short

period of time, was terminated expeditiously on an average of less than eight hours, without maternal or fetal mortality, or other mishap.

#### SUMMARY AND CONCLUSIONS

Employing a combination of castor oil and quinine, nasal pituitrin, and artificial rupture of the membranes, attempt was made to induce labor in 150 obstetric cases, whose pregnancies had progressed beyond the period of viability. There were two failures, an efficiency of 98.7 per cent. The average period of time from rupture of the membranes to the onset of good pains was 1.81 hours for primiparas, 1.93 hours for multiparas. The average duration of labor was 9.65 hours for primiparas, 3.93 hours for multiparas, considerably below the averages for labors of spontaneous onset occurring over the same two-year period. Attention was called to the fact that most of the cases were selected at or near term, that this fact militated in favor of success for the method and must be considered in judging the results. The average labor of women not at term (based on baby weight) and of a group of cases in which labor was induced for toxemia was calculated, feeling that results in these groups would give a fairer idea of the practicability of the method. The results closely approximated those for the entire series.

The fetal mortality was 2 per cent or less. There was no maternal mortality. Morbidity was negligible.

It should be clearly understood that no recommendation is being made to employ this procedure as a routine simply because the labors are short and the fetal mortality low. The effort has been made to determine the limitations of a method of inducing labor, so that when we are confronted with a case demanding induction, we may know what to expect. That the method possesses certain advantages is evident. It possesses the high degree of certainty of the known operative means of induction such as the bag, without entailing the fetal mortality incident to such procedures. On the other hand, it appears to be as innocuous as the various medicaments employed for inducing labor, at least in cases near term, and far surpasses them in expectancy of success. The most serious limitation to its use is in women in whom the presenting part is floating. If used at all in such circumstances, the greatest care must be exercised to prevent prolapse of the cord.

A further commentary might be that the distinct shortening of the labors reported casts still further doubt on the accuracy of the usually accepted statement that a dry labor is likely to be a long one.

#### REFERENCES

- (1) *Guttmacher, Alan, and Douglas, R. G.*: AM. J. OBST. & GYNEC. 21: 485, 1931.
- (2) *Mayes, H. W.*: N. Y. State J. M. 26: 384, 1926.

## DISTURBANCES OF MENSTRUATION DUE TO SIMPLE ACHLORHYDRIC ANEMIA

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**M**ENSTRUATION is governed primarily by the internal secretions of the ovary and of the pituitary gland, but also is influenced by other factors. It has long been known that various disease conditions may cause abnormal menstrual function. We wish to call attention to the menstrual disturbances due to simple achlorhydric anemia, since this disease occurs quite frequently and so commonly escapes recognition, even in cases of long standing. The recognition and proper treatment of the anemia is followed by rapid improvement and often by a cure of the menstrual disturbance, which is the complaint usually causing the patient to seek medical advice.

Simple achlorhydric anemia is a chronic anemia of cryptic origin which occurs almost always in women. It is constantly associated with achlorhydria or very low content of free acid in the gastric juice. The anemia is hypochromic as contrasted with the hyperchromic type characteristic of pernicious anemia, which is also of unknown origin and associated with gastric achlorhydria. One of us (R. L. H.) has discussed fully<sup>1</sup> this type of anemia and has reviewed the findings of other workers. English observers, especially Witts,<sup>2</sup> have made the most complete studies of this clinical syndrome. It has been designated by a number of different names such as "chronic chlorosis,"<sup>3</sup> "idiopathic hypochromic anemia,"<sup>4</sup> "chlorotic anemia with achlorhydria,"<sup>5</sup> and "simple microcytic anemia with achylia,"<sup>6</sup> but "simple achlorhydric anemia" suggested by Witts<sup>2</sup> seems the best term.

Our series includes 34 cases in which the clinical history, gastric analysis, and complete blood studies including volume index, are available. Several other proved cases have been seen but are not included in the report because of incomplete data. One patient was a man, and four of the women had passed the climacteric, so 29 patients are included in this study of the menstrual disturbances associated with this type of anemia.

The disease presents widely varying symptoms and signs. Most patients with simple achlorhydric anemia are aged thirty to fifty years. Sixty per cent of our cases were in this age group although patients aged fourteen years to seventy years were observed.

The disease is chronic and often exists unrecognized for years. Frequently in our series the patients were referred to us with such

diagnoses as toxic goiter or pulmonary tuberculosis. This type of anemia is commonly confused with pernicious anemia since it occurs without apparent cause and is accompanied by achlorhydria. However, free acid may be found in the gastric secretion after histamine stimulation. Digestive symptoms such as fullness after eating, gas, and epigastric discomfort are pronounced. The glossitis which occurs in some cases simulates that seen in pernicious anemia. In no case, however, have we seen organic lesions of the nervous system which are present so commonly in pernicious anemia.

## BLOOD FINDINGS

The blood findings are quite characteristic although variable (Table I). The red cell count is relatively high while the values for cell volume and for hemoglobin are low. Hence the color index and volume index usually are very low. Few conditions other than chronic

TABLE I. TYPICAL BLOOD FINDINGS IN SIMPLE ACHLORHYDRIC ANEMIA

CASE NO.	ERYTHROCYTES	VOLUME OF PACKED ERYTHROCYTES (PER CENT OF NORMAL)	HEMOGLOBIN (PER CENT)	VOLUME INDEX	COLOR INDEX	LEUCOCYTES
7	4,000,000	60	53	0.75	0.66	6,600
10	3,000,000	50	32	0.83	0.53	4,000
12	5,260,000	66	45	0.63	0.42	5,050
17	4,210,000	70	55	0.83	0.65	5,500
19	4,160,000	66	52	0.79	0.62	7,300

hemorrhage show such striking blood findings. The leucocyte count shows nothing unusual. The number of white cells usually ranges from 4,000 to 7,000. The platelets are abundant. The stained blood film shows microcytosis and anisocytosis, and central pallor of the erythrocytes.

The symptoms presented by the patients fall largely into three groups: (1) symptoms due primarily to the anemia, such as weakness, pallor, palpitation, dyspnea, and edema; (2) gastrointestinal symptoms, such as indigestion, diarrhea, glossitis, and dysphagia, and (3) abnormalities of menstruation.

In our series the menstrual disturbances occurred almost as frequently as symptoms due directly to the low hemoglobin content of the blood. Only 12 of the 29 patients gave a normal menstrual history. Eleven patients had metrorrhagia and menorrhagia. In three patients the intermenstrual interval was prolonged and there was also an excess flow at the menstrual period. In another patient the menstrual periods were irregular and the flow scanty, and in still another the menses appeared at irregular intervals and were always accompanied by an excess flow. Careful pelvic examination in each patient showed

no local pelvic lesion to account for the irregularity nor could any glandular disturbance be demonstrated. It is apparent that menorrhagia accentuates any anemia. That menorrhagia alone is not responsible for the anemia in these cases is best shown by the observation that the disorders of menstruation usually are relieved when the blood picture returns to normal after proper treatment.

#### CASE HISTORIES

The following are typical case histories:

CASE 1.—A housewife, aged thirty-seven, first was seen in the Cleveland Clinic in 1927 with a complaint of exhaustion. She had lost twenty pounds in weight, was nervous, and had been suffering from insomnia. She had not menstruated for six months. She had had at times a cracked and sore tongue and numbness in her hands and feet. The general physical examination at that time revealed nothing of significance. The blood count showed only 55 per cent hemoglobin, 3,330,000 red cells, and 7,500 white cells. Gastric analysis revealed achlorhydria. The stool examination showed no parasites or occult blood. Roentgen studies of the gastrointestinal tract showed no abnormality. The urine was normal.

The patient stated that her periods had been irregular from the onset of menstruation. Menses frequently had been absent for from three to six months. The menstrual flow always had been excessive. Repeated pelvic examinations had revealed no abnormality in the pelvic organs to account for the menstrual difficulties.

Liver was prescribed and this was taken daily (one-fourth to one-half pound) for four years. The blood counts were repeated at intervals for about a year but showed little change. Dilute hydrochloric acid was administered from time to time without result. After the patient had taken liver and hydrochloric acid for nearly four years, the red cell count was 4,500,000 and the hemoglobin was 57 per cent. The volume index was 0.73 and the color index 0.63. Menstrual irregularity continued, and the weakness and other symptoms were unchanged. At this time the liver and hydrochloric acid were discontinued and Bland's pills, grains 20, were given three times daily. The blood picture rapidly returned to normal and has remained so. The patient's weight increased from 110 to 141 pounds. All symptoms of weakness disappeared. The menstrual periods became regular (twenty-eight days) and the flow normal. The patient stated that her menses never before had been so regular.

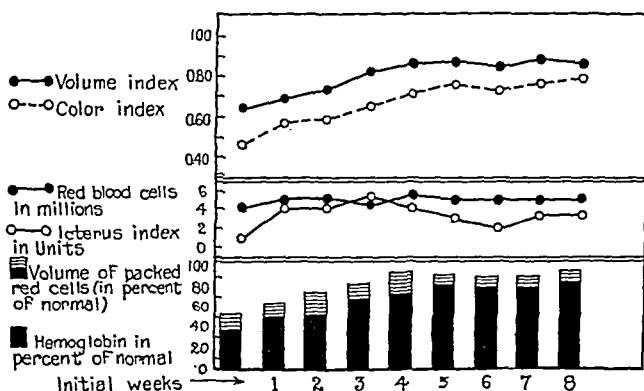


Fig. 1.—Weekly blood study of a patient with simple achlorhydric anemia, having adequate iron therapy. Note the gradual rise in the volume of packed red corpuscles and increase in hemoglobin content, with an increase in average cell volume. There is very little change in the total erythrocyte count or icterus index.

CASE 2.—A school-teacher, aged thirty-four, presented herself to us in April, 1931, because of palpitation, dyspnea, and weakness. These symptoms had been present for a year and had been increasing in severity. The menstrual flow had been excessive since puberty and the periods always irregular. Hyperthyroidism had been suspected as the cause of the symptoms and the patient had taken Lugol's solution without relief. A liberal diet with meat once a day had always been taken. Aside from constipation there were no symptoms referable to the gastrointestinal tract.

The patient was evidently anemic and there was diffuse enlargement of the thyroid gland. However, the basal metabolic rate was normal, and there was no clinical evidence of hyperthyroidism. The pelvic examination revealed no abnormality. The blood examination showed 4,580,000 erythrocytes, packed cells 60 per cent of normal and 42 per cent hemoglobin. Bland's mass, grains 60 each day, was prescribed. Three months later the red cell count was 4,780,000, the packed cells 93 per cent of normal and the hemoglobin 84 per cent. Six months after beginning treatment the blood examination showed approximately the same findings. All symptoms had disappeared and the periods had become regular for the first time since the onset of menstruation.

CASE 3.—In September, 1928, a young woman, aged twenty-two, consulted us because of menorrhagia. The menses had begun when the patient was thirteen, and had always appeared regularly but the flow was excessive, usually lasting two weeks with each period. One year before, and again in February, 1928, the patient had been confined to bed on account of weakness. The asthenia had been so marked that the patient had had to give up her work and enter the hospital.

The examination showed evident anemia and blue sclerae but no other abnormal findings. A pelvic examination revealed nothing to account for the menorrhagia. The blood examination showed 2,040,000 red cells, packed cells 42 per cent of normal and hemoglobin 30 per cent, with the volume index, 1.02 and color index, 0.75. The gastric analysis showed no free hydrochloric acid. Dilute hydrochloric acid, Bland's mass, grains 10, three times a day, and tincture of iodine were prescribed. The periods returned to normal for the first time since the onset of menstruation. Four months after treatment was instituted the erythrocytes numbered 4,610,000, the packed cells 78 per cent and the hemoglobin 65 per cent.

TABLE II

CASE NO.	DURATION OF TREATMENT	ERYTHROCYTES	VOLUME OF PACKED CELLS (PER CENT OF NORMAL)	HEMO-GLOBIN (PER CENT OF NORMAL)	VOLUME INDEX	COLOR INDEX	LEUCOCYTES
6		4,030,000	57	42	0.70	0.52	5,700
	6 weeks	4,840,000	91	81	0.93	0.83	6,450
18		5,020,000	66	49	0.66	0.49	6,700
	6 weeks	6,000,000	109	91	0.91	0.76	5,900
21		4,580,000	60	42	0.65	0.46	4,150
	3 months	4,780,000	93	84	0.96	0.87	4,200
23		5,170,000	69	55	0.67	0.53	5,150
	5 weeks	5,480,000	91	75	0.83	0.68	3,750
3		3,050,000	56	50	0.92	0.82	6,500
	10 weeks	4,960,000	94	81	0.95	0.82	6,700

## TREATMENT

The treatment of simple achlorhydric anemia, fortunately, is most satisfactory, since the disease responds almost specifically to iron



therapy (Table II). One should question the diagnosis, if the patient does not respond to the proper administration of iron, just as the diagnosis of pernicious anemia is questioned in the absence of the characteristic response to liver therapy. After the administration of iron, with relatively little change in the red cell count, unless this is low, there is a rapid rise in the cell volume and hemoglobin so the volume index and color index soon return to normal. Liver extract specific for pernicious anemia had been tried without any result by many of our patients and all other observers of this syndrome have reported a similar lack of response to liver. McCann and Dye<sup>5</sup> also found no response to treatment with a liver fraction supposedly specific for secondary anemia. The disease always recurs unless the administration of iron is continued, just as pernicious anemia recurs without constant ingestion of liver or liver substitutes. We have followed the plan of giving 20 grains of Bland's mass three times a day until the blood returns to normal and then giving 10 grains three times a way as a maintenance dose. We have seen no need for copper although it is possible that the iron which we have used contains copper. Earlier in the study we were convinced that iodine given as tincture of iodine was a valuable aid in treatment, and we still think that the iodine is a valuable adjuvant if only small doses of iron are used. Such good results are obtained by large doses of iron alone, however, that this method of treatment is the one of choice. All observers seem to agree that there is no necessity for giving hydrochloric acid, unless severe digestive symptoms such as diarrhea are present.

#### DISCUSSION

Simple achlorhydric anemia constitutes a definite clinical entity. Studies of the bone marrow have shown that it is crowded with normoblasts in the active stage of the disease just as the marrow is crowded with megaloblasts in untreated and active cases of pernicious anemia. There is an apparent disturbance in maturation of the normoblasts which leads to a diminution in the number of circulating erythrocytes and to the appearance of microcytes in the blood.

The possible relation of the achlorhydria to the anemia has been discussed frequently. It is well proved that anemia is more common when the free hydrochloric acid in the gastric contents is diminished or absent. It is probable that this results from the decreased iron absorption due to the absence of acid. In simple achlorhydric anemia, however, it seems most probable that the achlorhydria is only an indicator of the lack of some factor which is necessary for normal blood formation. This conception places the disease among the ever enlarging group of deficiency diseases. The characteristic response to iron may indicate that it is due merely to deficiency of iron in the body.

Simple achlorhydric anemia should be considered as a possible cause or factor in all cases of unexplained menstrual bleeding. A gastric analysis should be done if this disease is suspected and if achlorhydria is found, a careful blood examination usually is sufficient to reveal the correct diagnosis.

## SUMMARY

1. A study of the menstrual disturbances in 29 cases of simple achlorhydric anemia is reported.
2. Abnormalities of menstruation are found very commonly in this disease and constitute one of its most characteristic features.
3. Achlorhydria with idiopathic hypochromic anemia is pathognomonic of the disease.
4. The disease probably belongs in the deficiency group and responds well to the administration of adequate doses of iron.
5. Simple achlorhydric anemia should be suspected in all cases of unexplained menstrual disturbances and the suspicion verified or excluded by gastric analysis and careful blood examination.

## REFERENCES

- (1) *Haden, Russell L.*: J. A. M. A. 99: 1398, 1932. (2) *Witts, L. J.*: Guy's Hosp. Rep. 80: 253, 1930. (3) *Mettier, S. R., and Minot, G. R.*: Am. J. M. Sc. 181: 24, 1931. (4) *Heath, Clark W.*: J. Clin. Invest. 11: 808, 1932. (5) *McCann, W. S., and Dye, Jane*: Ann. Int. Med. 4: 918, 1931. (6) *Gram, H. C.*: Fol Hematol. 39: 461, 1930. (7) *Kaznelson, P., Reimann, F., and Weiner, W.*: Klin. Wehnschr. 8: 1071, 1929.

## THE NATURE OF PERIODS OF SEX DESIRE IN WOMAN AND THEIR RELATION TO OVULATION\*

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WHILE woman ordinarily is sexually stimulable at any period of the menstrual cycle, present evidence may be interpreted as indicating that commonly she experiences two periods of heightened sex desire. One of these periods falls at the inappropriate time for reproduction, just prior to menstruation, the other occurs during the post-menstruum, prior to the period of ovulation and at the fertile period of the cycle. The time of occurrence of the second of these periods is in harmony with present knowledge of the mammalian sex cycle, but the first period is difficult to explain by any physiologic knowledge now available. In this article I shall consider briefly some of the recent evidence concerning periodic receptivity in woman in relation to

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the mammalian sex cycle and set forth hypothetically an explanation of the premenstrual period of desire.

In practically all of the mammals so far studied ovulation typically coincides with or soon follows mating. The time of mating in these animals is determined primarily by the receptivity of the female, for even in those species in which the male sex organs undergo seasonal changes, copulation occurs only with receptive females. In other words, estrus, or the period of sexual receptivity, occurs at such a time that neither sperm nor ova must wait long for the union which results in fertilization.

Menstruation appears at the level of the primates, differentiating the cycles of the old world monkeys and apes which have been studied from those of lower mammals. In certain mammals, such as the dog and cow, bleeding, formerly confused with menstruation, frequently occurs at estrus, near the time of ovulation. But Hartman<sup>6</sup> discovered microscopic bleeding at about the time of ovulation in *Macacus mulatta* (= *M. rhesus*), a phenomenon which previously had been observed in woman, according to him and which since has been verified in one case by Simpson and Evans.<sup>9</sup> Hartman concluded that this midinterval bleeding, rather than menstruation, was analogous to the proestrus bleeding of lower mammals. Meyer and Saiki<sup>7</sup> have found since that the proestrus bleeding in dogs is produced by the action of estrus hormone on the uterus and therefore is not homologous with menstruation, evidence supporting Hartman's view.

So far no special period of sexual receptivity has been determined in the two species of macaques (*mulatta* and *irus*) that have been studied extensively. Three young but sexually mature female macaques of these two species, which I observed for several years, copulated on any days of the cycle, including the menstrual period, behavioral evidence which was verified for one of the animals by the finding of fresh deposits of sperm in the vaginal smears on all days of the cycle. These observations were made with captive animals, with the effects of captivity unknown. Such evidence does not eliminate the possibility of a sex rhythm in these animals, and particularly in older females in whom it more likely would be manifested. The fact that these macaques do copulate throughout the menstrual cycle is partly responsible for the prevalence of the opinion that in all sub-human primates, mating behavior occurs at any and all times. In the baboon the situation is somewhat different. Gear<sup>4</sup> reports that the female baboon, *Papio porcarius*, experiences definite periods of sexual receptivity. Zuckerman<sup>12</sup> finds a period of heightened receptivity in the female *P. hamadryas*, though he believes they are somewhat receptive at all times of the cycle. In these animals the period of greatest receptivity is accompanied by a voluminous swelling of the anogenital region, analogous to the lesser genital swelling in most lower mammals

at the time of heat. Tinklepaugh and Van Campenhout<sup>11</sup> have described cyclic changes of the vaginal epithelium in one mature chimpanzee. I have since verified the existence of these periodic changes in the vaginal mucosa of eight mature female chimpanzees which now are being studied. In addition I can state that the chimpanzee female also experiences definite cyclic periods of sexual receptivity, usually extending through the middle ten to fourteen days of thirty to thirty-six day menstrual cycles. Outside of these periods copulation seldom occurs, and then only under unusual social conditions. Furthermore, receptivity in these animals is always accompanied by pronounced ballooning out of the anogenital region. Though the time of ovulation in the menstrual cycle of the chimpanzee is not definitely known, it is reasonable to assume that it occurs near the midinterval, as in man, and in the previously mentioned macaques and baboons.

While most studies of the vaginal cell content of woman have failed to show conclusively the existence of clearly defined cyclic changes in the vaginal epithelium, they have been demonstrated by Papanicolaou through the study of vaginal smears. His work is still unreported.<sup>8</sup> Vaginal smears from chimpanzees and monkeys I have studied do not show a preponderance of cornified cells at any time in the cycle, as in the case of rodents, but quantitative study reveals marked cyclic changes in the percentage of epithelial cells of different types. In a few human preparations I have examined cornified cells increase sharply in number during the postmenstruum.

At the human level there appear psychologic factors sufficiently marked to obscure partially what I believe is basically the same biological estrus cycle observed in lower animals. Most important of these in connection with the present problem is the sexual stimulability of the human female. That woman ordinarily may be stimulated to sexual receptivity at any time of the cycle and frequently is unaware, on the basis of retrospection, of any regularly occurring period of enhanced desire, does not disprove the existence of such periods. Davis<sup>1</sup> in her study of the sex lives of 2200 women, reports 272 unmarried and 126 married subjects who designated regular periods of sex desire. Some of these experienced one period, some two. The times of occurrence relative to menstruation, as placed by these women, including duplications by those reporting more than one period, were as follows:

	BEFORE	DURING	AFTER	BETWEEN OR MIDWAY
Unmarried	205	46	152	20
Married	88	20	83	14

The one hundred married women who were subjects in Hamilton's study of marriage<sup>5</sup> (p. 161) placed the period of greatest desire relative to menstruation as follows: just before, 14; just after, 25; just

before and just after, 21; and during, 6. Nineteen of his subjects were unaware of such periods and 8 answered inconclusively. Hamilton's one hundred male subjects' reports concerning the periods of desire in their wives were in close agreement with the reports from his woman subjects.

Through the cooperation of other investigators I have had access to subjective reports and graphs of 16 college-trained women who recorded their impression of the varying degrees of sex desire through the menstrual cycle. While these few cases have little quantitative value the graphs so well illustrate the nature of reports based upon the retrospection of women subjects, that the general types are reproduced here in Fig. 1.

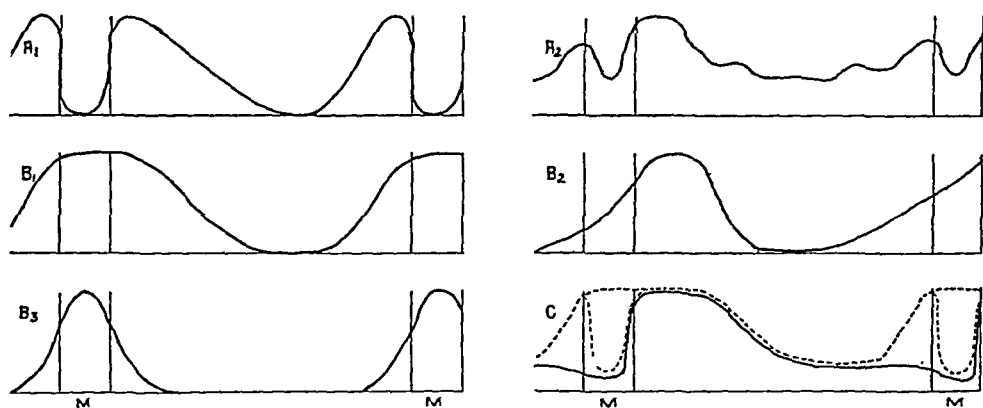


Fig. 1.—Types of rhythms of sex desire reported by 20 women on the basis of retrospection.  $A_1$ ,  $A_2$  (7 cases), dimodal curves.  $B_1$  (4 cases),  $B_2$  (2 cases),  $B_3$  (3 cases) unimodal curves.  $C$ , type of rhythm reported by four subjects on the basis of daily records of sex desire and affectionateness kept from four to twelve months. The dotted lines represent degrees of affectionateness. In all types the period of least desire falls during the third week of the cycle. Thirteen subjects reported various degrees of pain or distress preceding or accompanying menstruation.

Though the results of Hamilton's and Davis' studies show remarkable coincidence in the reported occurrence of the period of greatest desire near the time of catamenia, they are at variance in the frequency with which the periods are reported to occur before, after, or before and after the flow. Ellis<sup>3</sup> (pp. 103, 104) quotes Kraft-Ebbing who states that the period of heightened sex desire occurs after menstruation, Adler, who places it before, during, and after, and Campbell who questioned husbands and found their declarations three to two to the effect that there was greatest desire before the flow. Ellis himself states that "whatever doubt may exist as to the most frequent state of the sexual emotions during the period of menstruation, there can be no doubt whatever that immediately before and immediately after, very commonly at both times, . . . this varying slightly in different women, . . . there is usually a marked heightening of actual desire." Marie Stopes<sup>10</sup> (opp. p. 42), without giving the source or extent of her evidence, presents a bimodal curve of desire in which the

crests fall within the limits of the twelfth to seventeenth and twenty-fifth to twenty-seventh days of the cycle and with low points through the first six or seven days and recurring between the twentieth and twenty-second days. In various works on physiology, gynecology, and obstetrics reference is made to periods of heightened receptivity in woman, with no general agreement as to whether these most commonly fall during the pre- or postmenstruum, or at both times.

Conclusions from evidence as unobjective as much of that presented must be drawn cautiously. Many women with whom the problem is discussed at first are unaware of a regular rhythm of sex desire. Furthermore, introspection and particularly retrospection, commonly used in investigating problems of this nature, are dangerous though necessary tools for use in securing scientific information. Though undoubtedly the problem will not be settled with finality until the endocrine functions controlling estrus are better understood and until laboratory methods and instruments such as the galvanometer are brought to play upon the emotional factors involved, certain general conclusions can be arrived at. As indicated by the curves of sex desire reproduced here as Fig. 1, as well as by the quantitative results reported by Davis and Hamilton, it is evident that there is great variability in the time of occurrence and extent of periods of heightened desire in various individuals. On the other hand, the testimony of women predominantly indicates first, that enhanced desire occurs most commonly around the time of menstruation and second, that for women in general there is a bimodal curve of heightened sex stimulability, with the crests falling during the pre- and postmenstruum.

Dickinson, in 1927,<sup>2</sup> collected, analyzed and coordinated graphically on the basis of the menstrual cycle, much of the available material concerning the reproductive cycle in woman. In this manner he was able to show a general correspondence between the much questioned though frequently quoted "wave of well-being," variously attributed to Van Ott, Reiml and Sellheim, and the bimodal curve of sex desire secured by Davis, in each of which a primary crest occurs during the premenstrual week, followed by a drop during the flow, and a secondary crest during the postmenstruum. Of importance here is his graphic presentation of data concerning conception from isolated coitus in over 1000 cases (taken from Zangmeister, Pryll, Siegel, Isamer and others) which was plotted against the time of ovulation as determined by such investigators as Schroeder, Ruge, Halban, and Fraenkel. Ovulation is shown to occur most commonly between fourteen and nineteen days inclusive. The period of greatest fertility, as shown by the conceptions from isolated coitus falls in the neighborhood of the eighth to twelfth days of the cycle, though conceptions are common from the second to eighteenth days and occurred in small numbers throughout the cycle. Following are some of the conclusions drawn by Dickinson

from his study: "There is no time in the month at which conception has not occurred in some women." "The premenstrual week constitutes the relatively 'safe period,' or 'low-risk period,' when the average chance of pregnancy is less than one in ten." "The height of fertility belongs to the week or ten days following menstruation."

The data on conception from isolated coitus are based on the reports of women, most frequently in cases during the World War where conception resulted after visits of German soldier husbands on furlough. In all of these cases reliability depends upon the fidelity of the subjects' reports and the accuracy of their memories. In cases where subjects experienced extramarital relationships the natural tendency would be to make the data of fertile coitus coincide with the time of the husband's presence at home. Where such circumstances are not involved memory of events from one to nine months past would frequently be faulty. Further complications arise from variability in the length of the menstrual cycle, a feature Dickinson allowed for so

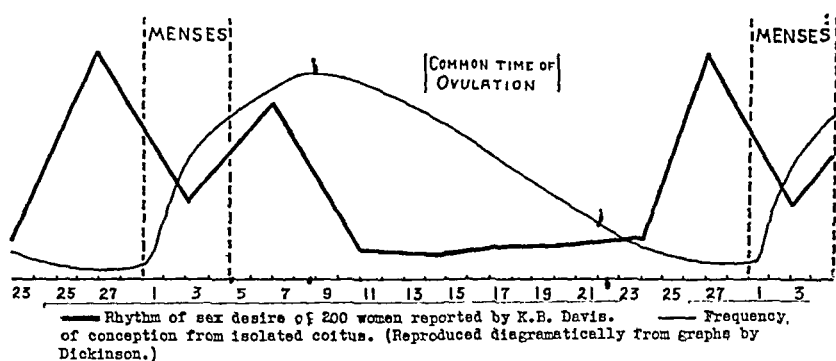


Fig. 2

far as possible, and the varying duration of menstruation. The large number of cases cited leaves little doubt but that the common trend among women is indicated, though, for the reasons cited above, with a degree of error which may explain the reports of conception during what may well be regarded as the sterile period of the cycle.

According to the evidence so far presented events in the sex cycle of woman should occur approximately as shown in Fig. 2. This graph, however, is made up of the composite data secured from a large number of cases, and for that reason the curve of sex desire, for example, must not be considered as typical for individual subjects.

Problems which arise from this assemblage of material concern the occurrence of heightened "sex desire" at the time just prior to menstruation when it is inappropriate from the standpoint of reproduction, and the gap which exists between the period of desire following menstruation and the time of ovulation.

An answer to the first problem is suggested by observations I have made upon chimpanzee females and corroborated by evidence secured

from a limited number of women and from the reports of husbands concerning their wives.

One chimpanzee female grew up and matured in our laboratories while caged with the male with whom she mated and by whom she later was impregnated. In her thirty to thirty-six day menstrual cycles, which are being described in detail elsewhere,<sup>12</sup> sexual receptivity, accompanied by pronounced genital swelling, occupied sixteen to eighteen days of the cycle beginning between the tenth and thirteenth days. During her periods of receptivity the two animals usually copulated three or more times daily, and there were frequent demonstrations of friendship and affection between them. After her sexual ardor waned and the genital swelling receded there was a brief period when the two animals were indifferent to each other. For a day or two at the end of the cycle, and sometimes during the first one or two days of menstruation, the female manifested an emotional state in which she constantly sought the nonsexual attentions of the male; that is, to be near him, to pick through his fur or to embrace him or be embraced by him. The male, still indifferent to her, evaded or repelled her attentions at these times. Crying and moaning she responded by constantly seeking him. This portion of the chimpanzee cycle I refer to as the "affectionate period," as contrasted with the period of sexual receptivity. Nonsexual affectionate behavior of this kind was also manifested by the same animal during periods of non-receptivity through gestation. I have since observed similarly occurring affectionate periods with another pair of highly congenial animals, and also between two friendly females who occupied the same quarters and who, incidentally, showed no evidence of homosexuality.

Inquiry of women concerning the existence of such a period in the human cycle has brought varied results. Many women are unaware, on the basis of retrospection, of any regular rhythm in their sexual desire. It is not surprising to find equal uncertainty concerning their general emotional state during the cycle. Thus one woman, admittedly frigid, though extremely fond of her husband and child, was unaware of either sex desire or increased affectivity at any period of the cycle. Another, while declaring she was equally affectionate throughout the cycle but was sexually desirous only under stimulating circumstances, states that coitus occurred most frequently during the pre- and postmenstrual weeks. A third experienced keen desire during the two postmenstrual weeks but was without either affection or passion toward the end of the cycle. At this latter time she wished to be left alone. She did not want to be touched by members of either sex. But some positive results have been secured. Two college-trained women who were unaware of the nature of the information I sought, described a period of increased affection just prior to and at the onset of the flow. At that time, in the words of one of them, she "craves to be



petted and loved by her husband" but was without sex desire unless stimulated. Her statement was verified by her husband. The observations of three other women and the reports of three husbands concerning their wives, covering periods of from four months to a year, indicated that in the absence of other stimulating circumstances which arouse desire, there was a period of increased affection without conscious sex hunger, falling variably just before or before and during the first days of the menstrual flow. These same women were aware of heightened affectivity in addition to sex desire during the post-menstrual week. Two biologically trained women kept daily records of both physical and psychologic changes over periods of four months and a year respectively. In the first one desire was at its height between menstruation and the fourteenth to sixteenth days in the four twenty-three to twenty-nine day cycles. Exuberance or physical well-being showed a high correlation with sex desire. "Affection" in this subject was at low ebb during menstruation and reached its maximum between days nine and sixteen. It then waned rapidly to reappear during the last three to five days of the cycle. The second of these subjects, somewhat critical of my designation of the premenstrual emotional state as affection, describes her feeling at that time as one of dependence. She states: "At that time I am dependent. If I have anyone about who will act as a leaning post, I lean. It looks like affection, I suppose, but it is quite selfish. As long as things run smoothly I am good tempered. But if I have to do things I don't want to do, or if anyone displeases me, I have a dreadful time being reasonable, patient, or polite. I would hesitate to call this condition affection, though when in the company of loved ones it would certainly seem like it, even to me." The affectivity which follows the flow, which continues until approximately the midinterval, and which is correlated with sex desire "is much more trustworthy. It weathers small storms better. It does not notice things that immediately prior to and at menstruation become unbearable." Cyclic changes in desire and affectionateness as reported by these subjects are shown in Fig. 1-C.

Whether the response of the female during the premenstrual period under discussion represents a demonstration of affection in the usually accepted sense may be questioned. But the evidence cited above indicates that commonly at that time the emotional state of woman is such that affectionate display of nonsexual nature is desired or demonstrated. That affection for the male, devoid of sex factors, if possible, is proved not only by the reports of the women subjects but also by the occurrence of such states in the chimpanzee female during periods of nonreceptivity.

In the chimpanzee and the macaque sex behavior most commonly occurs in routine manner similar to that of food taking or the satisfaction of other physical demands, except that any emotion arousing

situations may lead to it. Fondling, kissing and other preliminaries to coitus ordinarily are absent. In the case of man both male and female are highly stimulable sexually. With them demonstration of affection has developed, perhaps by individual association or conditioning, so that it readily leads to sex stimulation and coitus. This stimulability of man accounts for the frequency of sex relations during the premenstrual affectionate period. Furthermore, in their retrospection and reports, women commonly determine the periods of desire by the occurrence of coitus. For these reasons it is apparent that in an organism as highly stimulable as man the occurrence of coitus is not adequate evidence of heightened sex desire.

In addition to these data several women indicated that coitus during the premenstrual period is not satisfying to them. This has important bearing upon the use of the premenstrual "sterile" period for a birth control measure. All too often, and particularly in earlier years, such measures have represented bare-faced effort to provide a "safe" time or method for the male to secure sexual satisfaction, without consideration of the psychosexual needs of woman. Utilization of the premenstrual period for this end with women who are normally arduous sexually, but who do not secure satisfaction from coitus at that time, would in all probability lay the foundation for psychophysiologic disturbances, the detriment of which might greatly outweigh the benefits to be secured.

There are nonemotional factors other than those already mentioned, which partially determine the nature of data secured concerning women's periodic receptivity. Some of these will be mentioned briefly.

There is no reason to believe that among lower primates menstruation is anticipated. It commonly is experienced, with preceding or accompanying malaise, as in women, and is frequently followed by hyperactivity. In woman menstruation not only bears these physiologic accompaniments but is a temporal hitching post in the calendar of her activities. She anticipates and prepares for it and her program, both social and otherwise, is shaped around it. As a result of this anticipation and preparation, as well as of the physiologic accompaniments during the preceding or initial days of the flow, attention is focused to a considerable extent upon the genital tract. Consequently there arises temporarily what may be termed a "genital consciousness," the implications of which need no discussion.

Contrary to the "wave of well-being," of Van Ott, Reinl or Sellheim, previously referred to, in which the primary crest falls during the four premenstrual days, many women (14 out of 20 from whom I have reports) suffer both depression and physical distress at this time, coincidently with the affectionate period. This psychophysiologic state is one of the determinants of their affectivity.

From the evidence so far adduced it appears that the period of heightened "sex desire" which falls at the reproductively inappropriate time after ovulation and just prior to or prior to and during the first days of the menstrual flow is in reality a period of increased nonsexual affectivity. Though this period is essentially nonsexual in nature, because of the high degree of sexual stimulability of both man and woman it is one of the two periods in the cycle in which coitus most commonly occurs. This period contrasts with the one of "fruitful" receptivity which follows menstruation in that the former is nonsexual and essentially a psychologic response to the physiologic disturbances of the premenstruum, while the latter is primarily sexual, though influenced by some of the same affective factors.

There is a second problem on which some of the factors already discussed have a bearing. Between the crest of the postmenstrual period of desire as determined by Davis, and the common time of ovulation according to laparotomy evidence, Dickinson's graphs show a decided gap. The crest of the desire curve falls between the sixth and seventh days of the cycle. The common time of ovulation is between days fourteen and nineteen. This indicated disparity in time between receptivity and ovulation is contrary to the findings in other mammals and there is no evidence that human sperm and ova will wait for each other or remain functionally efficient over so long a period. Ovulation may be induced by orgasm and Dickinson suggests this as an explanation of the disparity in time between the occurrence of fruitful matings and the time of ovulation as shown by laparotomy. Purely mechanical factors arising from exertion or pressure might hasten the rupture of ripe follicles. Either of these would result in advancing the time of ovulation in the cycle in cases of fruitful coitus, which would not be inconsistent with the sequence of events in other mammalian cycles. Other factors explaining the gap between time of reported desire and ovulation are best indicated by considering the conditions which lead to coitus during the period, for, as I have stated, receptivity as reported, and this is particularly true if the reports are based upon retrospection, is estimated largely by the occurrence of the sex act. During the postmenstrual period of desire, woman experiences a lowered threshold of stimulability, in addition to consciousness of sex desire. The genital consciousness previously mentioned carries over into the early postmenstrual days. Equally important is the factor of habitual abstinence during the flow, which affects the postmenstrual responses of both wife and husband. As a result of the inter-play of these factors coitus occurs most frequently during the early days of the period following the flow. Man's sexual vigor ordinarily is not such that coitus is repeated three or four times daily throughout the female's period of receptivity, as it is in the chimpanzee, and a state of partial or complete satiety is reached early in

woman's period of desire. This advances the crest of the curve of reported desire away from the time of ovulation and toward the time of menstruation, though the actual period of receptivity would otherwise extend well over to or through the period of ovulation. Partial verification of this is found in the persistence of relatively high frequency of isolated fruitful coitus well over toward the middle of the common ovulation time.

Briefly summarized my conclusions are as follows:

The monthly curve of "sex desire" in woman as reported by other investigators is bimodal, one crest of the curve occurring at the reproductively inappropriate time following ovulation and just before menstruation, the other falling just after menstruation, during the fertile period of the cycle. Observation of chimpanzees in which just prior to menstruation there occurred periods characterized by affectionate demonstrations of nonsexual nature, led to the belief that the premenstrual period of "desire" in woman might be similar. Records of women and husbands kept through several cycles corroborated this view.

The premenstrual period in woman is characterized by hyperaffectivity not primarily sexual in nature but easily assuming a sexual form and leading to nonfruitful coitus. The postmenstrual period is one of true sex desire. It extends from the middle or end of the menstrual flow well over to the time of ovulation near the midinterval, though coitus occurs most often during the early days of the period. This period corresponds with estrus in other mammals, and leads to fruitful coitus.

These conclusions are hypothetical and are put forth with inadequate evidence in the hope that other investigators more favorably situated for studies of this nature may either verify or disprove the thesis.

#### REFERENCES

- (1) Davis, Katherine Bement: *Factors in Sex Life of 2200 Women* 20: 430, 1929.
- (2) Dickinson, R. L.: *AM. J. OBST. & GYNEC.* 14: 718, 1927. (3) Ellis, Havelock: *Studies in the Psychology of Sex*, ed. 3 1: Philadelphia, 1913. (4) Gear, H. S.: *South Africa J. Sc.* 23: 706, 1926. (5) Hamilton, G. V.: *A Research in Marriage*, New York, 1929, 13: 570. (6) Hartman, Carl G.: *J. A. M. A.* 92: 1992, 1929.
- (7) Meyer, R. K., and Saiki, S.: *Proc. Soc. Exper. Biol. & Med.* 29: 301, 1931.
- (8) Papanicolaou, G. N.: *New York State J. M.* 29: 812, 1929. (9) Simpson, M. E., and Evans, H. M.: *Science* 68: 453, 1928. (10) Stopes, Marie Carmichael: *Married Love*, ed. 18, London, 1926, 17: 163. (11) Tinklepaugh, O. L., and Van Campenhout, Ernest: *Anat. Rec.* 48: 309, 1931. (12) Tinklepaugh, O. L.: *Am. J. Anat.* (13) Zuckerman, S.: *Proc. Zool. Soc. London*, 691-754, 1930.

# TETANOSPASMODIC UTERINE RINGS, WITH A REPORT OF FOUR CASES

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THE prolonged suffering that parturients experience whose labors are complicated by persistent uterine contraction rings, the high morbidity and mortality of mothers and infants due to failure of early recognition and prompt treatment, and the comparative frequency with which this anomaly is met, should prompt obstetricians to give careful study and thought to this subject.

The difficulties that the student of this form of dystocia is confronted with are the confusion that prevails in the terminology, the disagreements as to the structures involved in the formation of the lower uterine segment, the differences in opinion as to the formation and location of contraction rings, their function in normal labor and their pathologic behavior.

Whether the lower uterine segment is formed from the upper part of the cervix or whether the lower portion of the uterine body also takes part in its formation are only of academic interest, so long as the view is adopted that this segment is the passive and obliterative portion and that it is separated during labor from the upper uterine segment by Bandl's ring in a plane passing through at the uterovesical reflection of the peritoneum.

Bandl's ring is formed during the first stage of labor when it is located about 8 cm. from the external os. This ring moves progressively upward in the pelvic cavity with the uterine retractions of normal labor. Intrauterine examinations during active labor will at times reveal the existence of additional rings above Bandl's ring. This phenomenon I have observed on a number of occasions during version. Fortunately these rings dissolve during the periods of uterine relaxation. They are physiologic in function, aid in the progress of labor, and are true retraction rings. They are to be differentiated from rings that form in abnormal labor which persist in tetanic spasm and interfere with the progress of labor. The latter have here been designated tetanospasmodic uterine rings.

Harper's<sup>1</sup> differentiation between retraction and contraction rings adds to the confusion already existing in the terminology. He maintained that a retraction ring is present in a uterus that is in general retraction, while a contraction ring is present in a uterus manifesting physiologic contraction and relaxation. He conceded that the formation of both rings is caused by similar etiologic factors, that both are

fixed in position and are not retracting, and that both are in tetanic spasm and cause a halt to the progress of labor, and also that, "the contractions in retraction ring dystocia are not unlike those met in tonic contraction ring."

To obviate confusion, the term "retraction ring" should only apply to a condition where the upper uterine segment and ring are periodically contracting, retracting, and relaxing, and where the canalization of the cervix and the retraction of the lower uterine segment are proceeding normally. The term "tetanospasmodic ring" should apply to a condition where the upper uterine segment contracts and relaxes typically or atypically, but where the ring has contracted into a state of tetanic spasm and is not being retracted, and where the lower uterine segment is in a more or less flaccid state and is also not being retracted.

The literature on this subject dates back to 1743, when Smellie<sup>2</sup> reported the case of a parturient five days in labor in whom the cause of the dystocia was the presence of two uterine rings in tetanic spasm, one around the child's neck and the other around its shoulders. His attempt at forceps failed. He did a craniotomy and with great difficulty succeeded in extracting the rest of the body. The mother had a stormy and lengthy convalescence.

Baltzell<sup>3</sup> reported a case of uterine ring dystocia with early rupture of the membranes, where after several attempts with the forceps the woman succumbed. A postmortem made four hours later still showed the presence of a firm muscular ring forcibly surrounding the neck of the child.

Sinnetamby<sup>4</sup> in 1905 reported a multipara three days in labor in whom a ring in tetanic spasm was so firmly gripping around a prolapsed arm that it was impossible under deep narcosis for him to insinuate his finger between the presenting arm and the ring. The patient died thirty-four hours after a cesarean section and hysterectomy were done. The baby survived.

Alderson<sup>5</sup> in 1913 reported two cases of uterine ring dystocia. Each was a para vii and both had six previous spontaneous deliveries.

The first case, an R.O.P., was fully dilated in six hours after the onset of labor, when progress ceased. Three injections of 1 c.c. pituitrin were given at three-hour intervals without effect. Application of forceps was also without results. Delivery was finally accomplished with difficulty by craniotomy. The mother survived.

The second case, an R.O.A., was fully dilated in nine hours from the onset of labor. A ring in tetanic spasm was located at a level with the umbilicus. Under deep narcosis the ring relaxed sufficiently to do a cephalotripsy and version. But to complete delivery it was necessary to do a cleidotomy and embryotomy. The mother survived.

White<sup>6</sup> in 1913 published statistics of 90 collected cases of uterine ring dystocia with the following percentages: With laparotomy the maternal mortality was 31.5 per cent, without laparotomy 58 per cent. The infant mortality with laparotomy was 42 per cent, without laparotomy 63 per cent. He arrived at the conclusion that where the ring is in persistent tonic expectant measures are useless and that cesarean section offered the best means of terminating labor.

Michael<sup>7</sup> in 1925 published statistics of 40 collected cases with the following percentages: With laparotomy the maternal mortality was 33 per cent, without laparotomy 20 per cent. The infant mortality with laparotomy was 40 per cent, without laparotomy 86 per cent. He arrived at the conclusion that conservative treatment as advocated by Harper was the best procedure in this dystocia.

In the four cases that Michael reported in the same paper, the first parturient, who was handled a great deal before she reached him and was in a precarious condition, expired during the attempt at craniotomy and embryotomy. At postmortem the ring was still present in a state of tetanic spasm, and it was impossible even then to pass the hand between the ring and the presenting part. In his second case conservative manipulations were ineffective and he had to resort to cesarean section. Both mother and infant survived. His third case had received pituitrin, instruments were applied and version attempted before she arrived at the hospital. Michael also attempted to deliver with forceps but without results. He did a supravaginal hysterectomy. Mother and baby succumbed. His fourth case, a para x, had been cesareanized in her fifth labor. Her last four labors were spontaneous. The dystocia was due to a ring in tetanic spasm around the child's neck. Notwithstanding the presence of a uterine scar and ruptured membranes, he decided on doing a version under deep narcosis and was successful. Mother and infant survived.

Harpers<sup>8</sup> in 1913 reported three cases of uterine ring dystocia. He succeeded in delivering them, although with great difficulty, under deep ether narcosis. The mothers all survived, but two of the babies were stillborn. Harper strongly advocated conservative treatment under deep ether narcosis.

White<sup>9</sup> in 1926 reported a case in which he did a classical cesarean section because of the presence of an obstructive pelvic tumor. He was unable to extract the baby from the lower uterine segment until he cut a ring that was present in tetanic spasm, of which he was unaware when he made his uterine incision.

Fink<sup>10</sup> in 1927 complained of the confusion existing in the terminology of uterine ring dystocia. He was of the opinion that spasms were possible in the lower uterine segment and cervix, and advised the administration of morphine and deep narcosis for their relaxation. In the event of failure by these measures he advocated doing a low cervical or vaginal cesarean section. He was opposed to manual dilatation, the insertion of bags or the application of traction to overcome the spasm.

Rucker<sup>11</sup> in 1927 reported two cases of ring dystocia wherein he succeeded in relaxing the rings and effecting delivery by the administration of 5 m of 1/1000 adrenalin solution. He was of the opinion that the drug caused a relaxation of the spasm through its action on the parasympathetic system.

Croft<sup>12</sup> in 1928 reported a case in which he attempted to relax the spasm of a uterine ring by suspending a six-pound weight from the presenting part for a period of eight hours with the patient under the influence of morphine and scopolamine, but failed in his effort. The fetus was finally removed by morcellment and the mother died six days later from acute toxemia.

He reported a second case of ring dystocia in a para xi, who had 10 previous spontaneous deliveries and was this time in labor with a seven and one-half months' premature, in breech presentation. Attempt at extraction resulted in the avulsion of a foot, but failed to budge the fetus. The administration of 6 m of amyl nitrite by inhalation relaxed the ring and delivery was accomplished in three minutes. He cites from the literature four other cases in which uterine spasms were relaxed by amyl nitrite.

#### REPORT OF CASES

My experience with the four cases reported below was not much different from the experience of others who were confronted with this anomaly. The parturients reached me after they were in labor for many hours and even days, and all of them had various internal manipulations done including the application of forceps before I had an opportunity to diagnose the cause of the dystocia.

While all the mothers went home from the hospital in good health, the first patient, a para ii, after a trying experience with conservative treatment, lost her baby and her uterus. The second case had a transperitoneal cervical section and went home with a living baby. The third patient lost her uterus but went home with a living baby. The fourth patient, a para i, was treated conservatively, survived, but lost her baby.

I am of the conviction, although I have no statistical proofs, that many more women than were reported in the literature have suffered in the past from uterine ring dystocia without having been diagnosed and have paid the penalties with the loss of their babies, with prolonged morbidity and even with the loss of their lives. I can only express the hope that tetanospasmodic uterine ring dystocia will in the future receive the attention it deserves on the part of the profession, in the textbooks and by teachers of obstetrics.

CASE 1.—Para ii, aged thirty, short and heavy built woman, abdomen pendulous, pelvic measurements ample. Her first child, aged three years, weighed 10 pounds at birth and was delivered with forceps.

Onset of labor was the morning of Feb. 19, 1928. Full dilatation and spontaneous rupture of membranes occurred on the evening of Feb. 20. Forceps were applied at 10 P.M. without results.

She was admitted to the Bronx Maternity Hospital Feb. 21, at 12:30 A.M. Position R.O.P., fetal heart sounds absent, temperature 99.4, pulse 120, respiration 24.

Under full ether narcosis I found a tetanospasmodic uterine ring located just above the symphysis which was so firmly gripping around the child's neck that I could not pass a single finger beyond the ring. She was given by hypo 5 m of  $\frac{1}{4000}$  adrenalin solution, when I rotated the head to the anterior position. Application of forceps failed to budge the fetus. The ring persisted in tetanic spasm.

At 1 A.M. she was returned to bed and given morphine gr.  $\frac{1}{4}$  and atropine gr.  $\frac{1}{150}$ . At 2:30 A.M. the morphine was repeated with the addition of 8 m adrenalin. She rested the entire night and following morning. At 12 noon the morphine, atropine, and adrenalin were given again. At 4:30 P.M. she was put under deep ether narcosis and at 4:45 she was given 10m adrenalin but without any effect on the ring. I now performed a craniotomy with the intention of doing a cleidotomy and embryotomy, but the ring was so taut around the child's neck that it was impossible to continue any further manipulations. Upon my intimation that I would perform a low cervical cesarean section, her people demanded additional consultation. Dr. Aranow was called. At 5:25 P.M. she was given by hypo morphine gr.  $\frac{1}{4}$  and atropine gr.  $\frac{1}{150}$ . At 6 P.M. she was put under deep ether narcosis and 15 m of adrenalin was administered. He applied traction with a cephalotribe, but failed to budge the fetus. The ring still persisted in tetanic spasm. Because of her condition it was decided to rest her up for the night under the influence of morphine, which was given at 10:40 P.M. and again repeated at 6 A.M. on February 22. She was now three days in labor without having made any headway. At 9 A.M. we performed a supravaginal hysterectomy. She had a stormy convalescence the first few days, but walked out of the hospital in good condition on the thirteenth day.

CASE 2.—Para i, aged twenty-one, pelvic measurements ample. Onset of labor May 9, 1928, at 10 A.M., when she was admitted into the Bronx Maternity Hospital under the care of her physician. Full dilatation and rupture of the membranes occurred at 10 P.M. She made no progress for the next thirteen hours.



I first examined her on May 10, at 11 A.M. The position was L.O.P., the lower uterine segment was hanging flaccidly over the presenting part, the upper uterine segment was contracting and relaxing periodically. There was no abdominal tenderness. Under full ether narcosis I rotated the head into an L.O.A. position. Traction with forceps was unsuccessful. Passing my hand above the child's head I found a uterine ring loosely around its neck, and a little higher another ring was present so firmly gripping the child below the shoulders that it was impossible to pass my hand beyond them.

The patient was returned to bed and given morphine gr.  $\frac{1}{4}$  and atropine gr.  $\frac{1}{150}$  in an ampule of 50 per cent magnesium sulphate. The latter was repeated every two hours for three doses. Examination at 6 P.M. showed that labor had made no progress and that the ring was still present in tetanic spasm. The temperature was 102°, pulse 160, and respiration 30. The fetal heart sounds were of good quality and the rate between 135 to 140. At 7:30 P.M. I performed a low double flap transperitoneal section and delivered a living baby. The temperature dropped the following day to below 100°, and never rose above 101°, for the next nine days, when she became normal. Mother and baby were discharged from the hospital in good health.

CASE 3.—Para i, aged thirty, pelvic measurements ample, position R.O.P. She was admitted into the Bronx Maternity Hospital in active labor on Aug. 16, 1930, at 2:45 P.M. Uterine contractions were at three-minute intervals and the membranes intact. At 8 A.M. the following morning her physician sent her home because she made no progress at dilatation. She returned to the hospital on August 19, at 11 A.M. in active labor and the membranes ruptured. At 12:30 P.M. she was fully dilated, when her physician applied forceps but failed to deliver. She was returned to bed.

At 2 P.M. a consultant ordered the administration of morphine gr.  $\frac{1}{4}$  and atropine gr.  $\frac{1}{150}$ . The vulva was now edematous, for which he also advised. At 6 P.M. the pains were very strong, temperature 102°, pulse 140, and respiration 40, but made no progress.

Upon examination under full ether narcosis at 9:30 P.M., I found that she was fully dilated, head in R.O.P. position, the upper and lower uterine segments relaxed and the presence of a tetanospasmodic ring which was firmly gripping the child's neck. A purulent discharge was coming from her uterus. At 9:45 P.M. she was deeply under the ether when I rotated the head into the L.O.A. position. An attempt at forceps extraction was unsuccessful. The ring was still persisting in tetanic spasm. The temperature was 104°.

At 11 P.M. I performed a classical cesarean section and supravaginal hysterectomy. I delivered a living child, although the fetal heart rate before the operation was 210. Her temperature dropped to normal on the ninth day. Mother and baby were discharged from the hospital in good health on September 6.

CASE 4.—Para i, aged thirty-three, position L.O.A. Fetal heart rate 138. Onset of labor Oct. 26, 1932, at 2 A.M. She was admitted into the Bronx Maternity Hospital at 3:45 A.M. and was given by hypo shortly thereafter morphine gr.  $\frac{1}{4}$  and atropine gr.  $\frac{1}{150}$ . Full dilatation and rupture of the membranes occurred at 5:30 P.M. and she had pains every two minutes. At 7 P.M. the head was a little below midpelvis and making no progress. Traction was applied with forceps without any results.

I examined her for the first time at 7:30 P.M. under ether narcosis and found the head in L.O.A. position, cervix fully dilated, the lower uterine segment hanging flaccidly over the presenting part and the presence of a tetanospasmodic ring around the child's neck. At 7:45 P.M. she was given 10 m of  $\frac{1}{1000}$  adrenalin. Within a

few minutes the ring relaxed and I succeeded in doing a version. Both arms and chin were easily delivered, but I had difficulty in extracting the rest of the head due to a disproportion between the biparietal diameter and the transverse diameter of the outlet, which was 9 cm. The baby weighed 8 pounds 13 ounces and had a large head. The child was stillborn. Its head diameters were not taken. The mother made an uneventful recovery and was discharged from the hospital in good condition on the tenth day postpartum.

### CONCLUSIONS

Tetanospasmodic uterine ring dystocia is a formidable and serious complication of labor of comparatively frequent occurrence, and if not recognized early and promptly corrected will result in a high morbidity and mortality of mothers and infants. If not relaxed by artificial means such rings may persist in tetanic spasm for a number of hours after death of the parturient.

### TERMINOLOGY

*A Tetanospasmodic Uterine Ring* is a band about two inches in width, composed of circular uterine muscle fibers that are in tetanic spasm, completely or incompletely surrounding the uterine wall in the upper segment, narrowing the lumen of the uterus, does not retract and prevents the propulsion of the fetus. One or more such rings may be present in uterine ring dystocia.

*A Retraction Uterine Ring* is a band about two inches in width, composed of circular uterine muscle fibers, located in the upper segment, completely or incompletely surrounding the uterine wall, narrowing the lumen of the uterus during a contraction, but which retracts and relaxes periodically during normal labor, aiding in the propulsion of the fetus. One or more such rings may be present in normal labor.

A normal Bandl's ring is a retraction ring, located at the beginning of labor about 8 cm. from the external os, is a part of the upper uterine segment and separates the latter from the lower uterine segment. This ring rises in the uterus with the advancement of labor.

The degree of canalization of the cervix in uterine ring dystocia depends upon the period during labor that the tetanospasmodic ring was formed. If it occurred early in the first stage of labor, the cervix will be only slightly dilated, the membranes will usually be intact and the ring will be in front of the presenting part. If the tetanospasmodic ring formed late in the second stage of labor, there will be complete canalization of the cervix, the ring will be beyond the presenting part, and the membranes will be ruptured.

The intensity of the pains in this anomaly will depend upon the character and periodicity of the uterine contractions and will also be influenced by the state of the nervous system, malposition and pelvo-fetal disproportion.

## ETIOLOGY

Tetanospasmodic uterine rings may form in primiparas and in multiparas with numerous previous spontaneous deliveries, in women with normal or abnormal pelvic measurements, with proportional or disproportional pelvofetal factors, prior to or after the rupture of the membranes. Any existing abnormalities, however, may enter into the causation of this form of dystocia.

Some of the direct causes of their formation are emotions, endocrine disturbances—especially hypoadrenalinism, ergot, pituitrin or other oxytocics, malposition, disproportion, pathologic rigidity of the cervix, obstructive pelvic tumors, attempts at manual or instrumental dilatation and the introduction of bags.

## DIAGNOSIS

The presence of a persistent diagonal abdominal furrow between the pubis and the umbilicus is the outward manifestation of the existence of a tetanospasmodic uterine ring. But if the ring is located behind the pubis, there will be no external evidence of its presence.

A prolonged first stage of labor, the body of the uterus contracting and relaxing at regular or irregular intervals, the abdominal pains corresponding in intensity to the uterine contractions and a cervix that does not progressively dilate are presumptive signs of the existence of a tetanospasmodic uterine ring.

A prolonged second stage of labor, the upper uterine segment contracting and relaxing at regular or irregular intervals, the lower uterine segment more or less canalized and hanging flaccidly over the presenting part, and an absence of retraction of this segment are positive signs of the existence of a tetanospasmodic uterine ring.

The presence upon internal examination of a rigid band of muscle in the upper uterine segment, with concave or convex surfaces, with a sharp or blunt inner edge, forming a barrier to the examining hand, is pathognomonic of the existence of a tetanospasmodic uterine ring.

Tetanospasmodic uterine ring dystocia is to be differentiated from tetanus uteri. In the latter there is no demarcation between the ring and the tonically contracted uterine body. In the former the lower uterine segment is in a flaccid state, in the latter the lower uterine segment is stretched to the point of rupture. In the former the fetal outline may be palpated, in the latter the fetal parts are not thus distinguishable.

## TREATMENT

In prolonged labor, with signs pointing toward the existence of a tetanospasmodic uterine ring, it is of the utmost importance that an internal examination be made, exercising scrupulous aseptic precautions.

Having established that a pathologic ring is the cause of the dystocia, the following procedures should be adopted:

*In the first stage of labor*, with the ring in advance of the presenting part and the cervix only partially dilated, give by hypo morphine gr.  $\frac{1}{4}$ , atropine gr.  $\frac{1}{150}$  in an ampule of 50 per cent solution of magnesium sulphate. Repeat the injection of an ampule of magnesium sulphate every two hours for three doses. Keep the patient isolated in a quiet room. If the ring has relaxed and the cervix has fully dilated, proceed to deliver by forceps or version, unless you are convinced that the parturient is capable of delivering spontaneously.

If the ring has not relaxed and the cervix has not dilated after the above treatment, give the patient an enema consisting of 2 ounces of ether and 2 ounces of olive or mineral oil, give by hypo morphine gr.  $\frac{1}{4}$  and atropine gr.  $\frac{1}{150}$  in an ampule of magnesium sulphate. Repeat the injections of an ampule of magnesium sulphate every two hours for three doses. Put the patient in a quiet room.

If the ring has not relaxed and the cervix has not dilated at the end of this course of treatment, a low cervical cesarean section should be done. If the ring is on a level with the pubis and there is no pelvofetal disproportion present, a vaginal cesarean section might be preferred.

Manual, instrumental, or other mechanical interference to dilate the cervix will aggravate the ring, and even if successful at artificial dilatation, the obstetrician will still be confronted with the ring in tetanic spasm.

*In the second stage of labor*, with the ring beyond the presenting part, in the absence of pelvofetal disproportion, the cervix fully dilated, put the patient under deep ether anesthesia for fifteen to twenty minutes, and at the end of this period, if necessary, give by hypo 5 to 15 m 1:1000 solution of adrenalin. If the ring does not relax, and the patient does not have a low blood pressure, cardiac degeneration or other contraindications, administer by inhalation 5 m of amyl nitrite. If the ring relaxes within five minutes, or if this occurs before the administration of the amyl nitrite, proceed with the delivery by forceps or version, as may be indicated.

In the event that the ring fails to relax after instituting the above treatment, attempts to deliver by forceps or version will meet with failure or possible disaster. Attempts to obliterate the ring manually or by prolonged traction of the presenting part will more often meet with failure than success and at a loss of valuable time. Under such circumstances, the obstetrician may select to rest the patient for a few hours under the influence of morphine and atropine and two or three doses of magnesium sulphate simultaneously with the rectal installation of 4 ounces ether in oil. This may be followed by the ad-

ministration of adrenalin, and if indicated, also by the inhalation of 5 m amylnitrite.

Should the ring persist in tetanic spasm, a low cervical cesarean section should be done. With the ring behind the symphysis and no pelvofetal disproportions present, a vaginal cesarean section may be preferred. The obstetrician would be justified to do a section after failing to relax the ring with the first treatment, or without any previous treatment, in the presence of pelvofetal disproportion and obstructive pelvic tumors, if he found that it was for the best interests of the parturient to proceed with the delivery.

I have submitted this report and suggested a simplified terminology with the hope that further interest may be stimulated in tetanospasmodic uterine ring dystocia, to the end that more accurate diagnostic signs will be observed and recorded and a procedure agreed upon that will be safe for mother and infant.

#### REFERENCES

- (1) *Harper, P. T.*: Clinical Obstetrics, Philadelphia, 1930, F. A. Davis Co., p. 58. (2) *Smellie*, (3) *Baltzell*: *Quoted by Croft*: *Lancet* 2: 166, 1928. (4) *Sinnetamby, M. J.*: *Obst. & Gynec.* 15: 114, 1909. (5) *Alderson, G. G.*: *J. Obst. & Gynec.* 24: 218, 1913. (6) *White, C.*: *Proc. Roy. Soc. Med.* pp. 70-85, 1913. (7) *Michael, W. A.*: *AM. J. OBST. & GYNEC.* 10: 111, 1925. (8) *Harper, P. T.*: *Am. J. Obst.* 68: 640. (9) *White, C.*: *AM. J. OBST. & GYNEC.* 11: 364, 1926. (10) *Fink, Karl*: *Monatsch. f. Geburtsh. u. Gynäk.* 95: 365, 1927. (11) *Rucker, M. P.*: *AM. J. OBST. & GYNEC.* 14: 609, 1927. (12) *Croft, C. R.*: *Lancet* 2: 166, 1928.

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### PRIMARY CARCINOMA OF THE OVIDUCT\*

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PRIMARY carcinoma of the oviduct as a clinical entity was denied for many years. Not until the publication of the classical report of Orthmann in 1886 was the fact of such an entity generally accepted. Orthmann analyzed the 13 cases published prior to his own and found all to be doubtful as to the real origin of the cancers. His own case, therefore, is the first undoubted primary carcinoma of the oviduct to be reported. Following this came numerous reports from other sources. Sängner and Barth, in 1895, collected 17 cases in the literature and added one of their own. Stolz and Zangemeister in 1902, and Peham in 1903, collected 51 and 63 cases respectively. In 1910, Doran published one of the most comprehensive and best arranged articles on the subject so far written. He reviewed 100 cases published up to that time. Since that time about 140 additional cases have been reported and the literature reviewed by a number of investigators.

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According to the work of Sanger and Barth, primary carcinoma of the oviduct occurs in three forms: (1) papillary, (2) papillary-alveolar, and (3) alveolar.

The primary papillary carcinoma of the tube histologically resembles malignant adenoma of the uterine endometrium. It has been so accurately described by Sanger and Barth, and Eberth and Kaltenbach, that nothing further need be added to their description. According to Sanger and Barth, the papillary form of carcinoma is the typical form of primary carcinoma of the tube. However, this form does not occur so frequently as one would assume from the statements of these authors. Probably more cases of the papillary alveolar type have been reported. According to Doran and Fearn the papillary type of carcinoma develops directly from papillomas of the tube. The epithelial covering of the tubal villi in most cases consists of a single layer, but in some cases of several layers associated with an accumulation of polymorphous cells in compact clumps and nests. Landau and Rheinstein observed irregular sharply demarcated epithelial accumulations separated by sparse bands of connective tissue in the wall of the tube. In most cases these epithelial accumulations contained cavities which were lined with flattened epithelial cells, giving a glandlike appearance. In those epithelial accumulations, which were solid, the transition into the alveolar form of carcinoma was quite pronounced, even though the structure of the tumor otherwise corresponded entirely to the papillary type. Von Rosthorn observed that the histologic picture varied at different parts of the tumor. In some places the alveolar form predominated. These alveoli varied considerably in size and form, but their margins were all distinct and all were composed of small cells. Eckardt in his report emphasizes the twofold character of the neoplasm. The papillary form passes over into the alveolar form. There can be no doubt that a papillary-alveolar form of primary tubal carcinoma does occur.

In view of the present concept of carcinoma, it seems almost useless to discuss the etiology of carcinoma of the oviduct. However, nearly all authors on this subject have speculated as to the possible cause of the condition, and most writers particularly emphasize the existence of long-standing chronic inflammatory conditions of the tubes as the chief predisposing factor.

Doran and Fearn state that primary tubal carcinoma results from malignant degeneration of the benign papillomas which are frequently found in catarrhal and suppurative inflammations of the tubes. Sanger and Barth believed that primary tubal carcinomas always develop upon the foundation of a long-standing chronic salpingitis and state that an intermediary papillomatous stage is not necessary in the development of the carcinoma. In recent years many cases have been reported in which no preexisting inflammatory condition of the tubes was observed. In these cases the pathologic processes that were present were apparently of only slight degree and more recent occurrence than the tumor itself. In some cases the fimbriae were still preserved and cicatricial formation could not be demonstrated. In other cases the few existing adhesions were probably due to purely mechanical causes such as the presence of nodules just beneath the serosa which produced a local inflammation and adhesions with the surrounding tissues. Eckardt points out the fact that primary tubal carcinoma, if it occurred as a result of previous inflammatory changes in the tubes, would be found much more frequently to affect both tubes, whereas actually, only a few cases of bilateral carcinoma have occurred. Unquestionably, long-standing inflammatory conditions in the tube may pre-

dispose to carcinomatous degeneration, but just as surely such neoplasms may occur in tubes which were not previously diseased. Horrock believed that microbes are directly responsible for tubal carcinomas and bases his belief on the fact that tubal carcinoma occurs chiefly in sterile women in contrast to carcinoma of the cervix and of the uterine corpus. Other theories as to the etiology of carcinoma of the oviduct attribute great significance to the age of the patient and the number of previous childbirths. Roberts believed that carcinoma of the tube probably develops from the wolffian duct.

Most cases of primary tubal carcinoma occur in the fifth decade. The youngest case reported is that of Norris in a girl of twenty-nine, and the oldest was reported by Novy in a woman of seventy. In general, the age incidence of primary tubal carcinoma corresponds to that of carcinoma in other organs.

From a study of previously published cases, there is little in the physical findings on which to base a diagnosis of primary tubal carcinoma. In most cases a diagnosis of some adnexal affection was all that could be made. In fact only a very few cases of primary carcinoma of the oviduct have been correctly diagnosed prior to operation. Most frequently carcinoma of the tube is mistaken for pyosalpinx, a pedunculated myoma or an ovarian cyst.

Metastasis of a tubal carcinoma may take place by continuity, contiguity, or by implantation on other organs. The common sequence of the secondarily affected organs is ovaries, uterus, intestine, omentum and peritoneum. More than 30 per cent of the reported cases have shown metastases. Kehrer states that primary tubal carcinoma may metastasize by either of two lymphatic channels, first to the superior lumbar and inguinal glands, as in carcinoma of the corpus uteri, and second, to the external iliac, hypogastric, and sacral glands, as in cervical carcinoma. It is to this fact, together with the thinness of the walls of the tubes which may quickly become penetrated by the carcinoma masses, that he ascribes the great malignancy of tubal carcinoma.

The prognosis of primary carcinoma of the oviduct is always poor. Most of these cases are seen late in the disease due to the relative paucity of signs and symptoms and the great difficulty of diagnosis. Metastasis takes place early in the course of the disease. Recurrence is common and often occurs very early, in Schaerer's case one month after operation. Only three five-year cures have so far been reported, with several other three- and four-year cases of freedom from relapse.

Treatment consists in prompt surgical removal of the affected tube and as much of the other pelvic tissue as is possible, including the uterus and pelvic glands. This should be followed by deep x-ray therapy.

#### CASE REPORT

Mrs. R. R., aged thirty-seven, married fifteen years, occupation housewife. Her mother died of apoplexy at fifty-five, and her father died of cancer at fifty-seven years. She had scarlet fever at the age of five years. Influenza in 1918 complicat-

ing pregnancy, which went to term. No operations. Chief complaint: Pain in perineum, and back since birth of last child three and one-half years ago, which were not associated with the menses. Menses began at fourteen, regular, twenty-eight days. Duration four to five days, normal in amount, no pain. Para ii, first thirteen and one-half years ago, last three and one-half years ago. No miscarriages.

Examination disclosed tenderness over right lower abdomen, and old lacerations of perineum. Uterus was normal in size and position and freely movable. Left adnexa were not palpable. In the region of the right adnexa an elongated mass about the size of a small sausage was palpable.



Fig. 1.—Carcinoma fallopian tube. (Low power.)



Fig. 2.—Carcinoma fallopian tube. (High power.)

Urine was negative except for slight albuminuria. Blood: R.B.C. 5,100,000 and W.B.C. 9,150; Hb. 80 per cent; differential count: polymorphonuclears 78; small lymphocytes 16; large mononuclears 4; eosinophiles 1; transitionals 1; sedimentation time 20 mm. in sixty minutes.

*Operation.*—Median incision. The fimbriated end and outer half of the right tube was occupied by a mass of friable tissue undoubtedly cancerous in nature. There were metastases to the posterior layer of the broad ligament and to the posterior layer of peritoneum in the region of the appendix. The right ovary, appendix, uterus, and left tube and ovary apparently were not involved. On account



of the metastases only the right tube and ovary were removed. An attempt was made to remove the metastatic nodules but on account of free bleeding and because the masses penetrated the peritoneum, the attempt was desisted. Vaginal drainage was instituted because of the bleeding. The patient had a normal convalescence and was discharged from the hospital fourteen days after operation.\*

*Microscopic Examination.*—Specimen consisted of an ovary 3.5 by 2.5 by 2 cm. to which some mesovarium with adherent tissue was attached and an oviduct together with small bits of tissue evidently broken from the latter. This oviduct was of very unusual appearance. It was approximately 8 cm. long. At the end which apparently had been severed from the uterus it was 1.0 cm. in diameter. Three centimeters beyond its attachment it suddenly expanded to about 4 cm. diameter, which diameter was continued to what was probably the fimbriated end. The surface of this expanded portion was roughly nodular and a cream yellow color. Within the lumen of this expanded end there were seen small nodular warty projections which were quite friable and resembled the small pieces of tissue which accompany this oviduct and the ovary.

The ovary presented a smooth surface which was broken by lobules covering cysts varying in diameter from 0.4 cm. to 1.5 cm. The lining of these cysts was smooth and the content of the cysts was a clear watery fluid. The mesovarium was thickened and showed small yellow nodules suggestive of the same growth seen in the oviduct. In general, there was no evidence that the growth had involved the ovary itself.

*Microscopic Examination.*—The section of ovary showed a cystic corpus luteum, several corpora albicantia and a small cyst lined with a single layer of columnar epithelial cells. There was no evidence of malignant change.

The sections of the oviduct and of the tissue attached to the ovary and taken to be part of the mesovarium, all showed the presence of an epithelial neoplasm. This growth was composed of rather tall columnar epithelial cells resting upon a fairly well-developed stroma of connective tissue which was richly supplied with congested blood vessels. These epithelial cells were sometimes arranged in a single layer about a blood-filled space and at other times were arranged in a single layer upon finger-like processes of connective tissue stroma. In a few places they were heaped up in a conglomerate mass upon the surface of the connective tissue stroma and in other places they penetrated the connective tissue in irregular columns. Hyperchromatic nuclei were occasionally seen.

*Pathologic Diagnosis.*—Follicular and corpus luteum cysts of ovary. Carcinoma of oviduct probably primary.

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#### REFERENCES

- Haselhorst, G.: Zentralbl. f. Gynäk. 55: 3008, 1931. Soubeiran: Gynécologie 30: 525, 1931. Anspach, B. M., and Hoffman, J.: AM. J. OBST. & GYNEC. 22: 424, 1931. LaBalle, L., and Patay, R.: Gynec. et Obst. 19: 286, 1929. Wharton, L. R., and Krock, F. H.: Arch. Surg. 19: 848, 1929. Klein, P.: Zentralbl. f. Gynäk. 53: 1810, 1929. Scott, E., and Oliver, M. G.: J. Lab. & Clin. Med. 14: 429, 1929. Frankl, O.: Ztschr. f. Geburtsh. u. Gynäk. 94: 306, 1928. Callahan, W. P., Schiltz, F. H., and Hellwig, C. A.: Surg. Gynec. & Obst. 48: 14, 1929. Bortin, E.: Ann. di ostet. 51: 294, 1929. Gittelsohn, J.: Monatsschr. f. Geburtsh. u. Gynäk. 79: 53, 1928. Wolfe, S. A.: AM. J. OBST. & GYNEC. 16: 374, 1928. Covarrubias, A., and Albertz, A.: Bol. Soc. de cir. de Chile 4: 186, 1926. Heil, K.: Zentralbl. f. Gynäk. 50: 2952, 1928. Zweifel, E.: Ergebn. d. Chir. u. Orthop. 20: 507, 1927. Bullemann, H.: Zentralbl. f. Gynäk. 51: 1037, 1927. Stanca, C.: Gaz. d. hôp. 100: 1155, 1927. Kittler, E.: Zentralbl. f. Gynäk. 51: 971, 1927.

\*Since the patient has been discharged from the hospital, she has undergone extensive x-ray treatment by Dr. J. Gershon Cohen. When last seen on July 20, 1933, she was, apparently, in perfect health and there was no palpable evidence of the disease in the pelvis or abdomen.

Barrows, D. N.: AM. J. OBST. & GYNEC. 13: 710, 1927. Beck, W.: Zentralbl. f. Gynäk. 50: 1503, 1926. Kurtz, H.: Ztschr. f. Geburtsh. u. Gynäk. 90: 133, 1926. Liang, Z.: Virchows Arch. f. path. Anat. 259: 577, 1926. Wechsler, H. F.: Arch. Path. & Lab. Med. 2: 161, 1926. Cameron, S. J.: Brit. M. J. 2: 285, 1925. Orthmann: Centralbl. f. Gynäk. 10: 816, 1886. Sönger and Barth: Martin's Handbuch der Krankheiten der weib. Adnexorgane, 1895. Stolz: Arch. f. Gynäk. 66: 365, 1902. Peham: Ztschr. f. Heilk. 4: 317, 1903. Doran, Alban: J. Obst. & Gynec. Brit. Emp. 6: 285, 1904. Landau and Rheinheim: Arch. f. Gynäk. 39: 273, 1891. Von Rosthorn: Ztschr. f. Heilk. 17: 177, 1896. Eckardt: Arch. f. Gynäk. 53: 183, 1897. Roberts: Tr. Obst. Soc. Lond. 41: 129, 1899. Norris, C. C.: Surg. Gynec. Obst. 8: 272, 1909. Novy: Monatschr. f. Geburtsh. u. Gynäk. 11: 1043, 1900. Kehrer: Monatschr. f. Geburtsh. u. Gynäk. 27: 327, 1908. Zangmeister: Beitr. z. klin. Chir. 34: 96, 1902.

## DISCUSSION

DR. CHARLES C. NORRIS.—The mortality from carcinoma of the tube is very great, and there is usually a recurrence after operation. Of forty-two cases which were traced by me some years ago only two were alive three years after operation.

CASE 1.—Patient examined in October, 1908 (reported by me March, 1909), aged twenty-seven years, married seven years. She had two children. No miscarriages. Her previous history was unimportant.

Patient gave a definite history of pelvic peritonitis following the birth of her last child which was four years previously. Subsequently the usual symptoms of chronic pelvic inflammatory disease were present. For five months preceding operation the character of the leucorrhea seemed altered becoming more profuse, watery and at times brownish, probably due to an admixture of blood.

*Preoperative Diagnosis.*—Bilateral pelvic inflammatory disease.

*Operation.*—Supravaginal hysterectomy and bilateral salpingo-oophorectomy. Vermiform appendix was found adherent and was removed. No enlarged glands were observed and the tubal carcinoma was not suspected until the specimen was examined in the laboratory. Convalescence was normal.

*Pathologic examination* showed a uterus evidently the seat of a perimetritis, but otherwise normal. The right tube was 11.5 cm. in length, retort shaped, with its greatest diameter 2.8 cm. through the ampulla. The external abdominal ostium was closed and in general appearance the tube resembled a hydrosalpinx. The walls of the ampulla were 3 or 4 mm. in thickness and the lumen was occupied by a soft grayish brainlike mass which tended to bulge through the opening. This friable neoplastic tissue apparently sprung through the entire circumference of the inner surface of the lumen. The right ovary was normal except for surface adhesions and the development of a number of retention cysts. The left tube presented the usual characteristics of a hydrosalpinx. Left ovary similar to the right.

*Histologic examination* showed a chronic endometritis, a papillary carcinoma of the right tube, a left hydrosalpinx, and bilateral peri-oophoritis. Careful sectioning of both ovaries failed to show any evidence of carcinoma. Full details of this case can be found in the March issue of *Surgery, Gynecology and Obstetrics*, 1909.

*Follow-up* showed no evidence of recurrence and the patient was alive and well nineteen years after operation.

CASE 2.—Patient examined May 18, 1932. Referred by Dr. M. Jaffe. Mrs. S. T., forty-eight years, married twenty-five years, three children, no miscarriages. Last child was born sixteen years ago. Menses were regular in periodicity, but somewhat more profuse and one day longer for four months previous to examination. A moderate amount of yellowish leucorrhea for years. No alteration in character. No pain. Occasional nausea and increase in size of lower abdomen was the patient's

chief complaint. Examination showed a multiparous outlet and cervix. The uterus was enlarged to the size of a two and one-half months' pregnancy. The adnexa were not palpable through the fat abdominal wall.

*Preoperative Diagnosis.*—Myoma uteri.

At operation the adnexa were found adherent and were removed with the myomatous uterus. The right tube appeared to have been converted into a hydro-salpinx and was densely adherent in the upper part of the culdesac. On freeing it some of the fluid contents escaped. It was then seen that the lumen contained solid brainlike material and the diagnosis of carcinoma of the tube was made. The general peritoneal cavity had been carefully packed off and every effort was made to remove every particle of the spill. Convalescence was normal.

*Macroscopic examination* showed a small endometrial polyp, a myomatous uterus, the largest tumor of which was edematous, left perisalpingitis, bilateral peri-oophoritis and a primary carcinoma of the right tube. The tube was retort-shaped, 11 cm. in length, greatest diameter 2.5 cm. through the ampulla and the surface more or less covered with adhesions. The walls were thin (2-3 mm.) friable, and the lumen dilated and occupied by pinkish gray, friable, vascular, solid tissue which possessed the usual macroscopic characteristics of carcinoma. The tumor was confined to the ampulla of the tube.

The diagnosis was confirmed by *histologic examination*—the carcinoma being of the medullary type, highly embryonal and containing many mitotic figures.

As soon as convalescence was established deep x-ray therapy was instituted and three full courses have been given. At last examination two weeks previous to date of this meeting a sausage-shaped mass could be felt on the right side of the pelvis which I fear is a recurrence, although the patient is now symptom-free and gaining weight.

DR. JACOB HOFFMAN.—I wish to recall two cases of primary carcinoma of the fallopian tube which were reported before this Society by Dr. Anspach and myself. Both patients were obese and both were considerably past the menopause, one being sixty-four and the other seventy-three years of age. The outstanding symptom in both cases was an intermittent bloody, serous discharge preceded with pain in the lower abdomen; this in a woman past the menopause is significant. A diagnosis of carcinoma of the tube in the early stage of the disease is very difficult but it may be aided by careful observation of the patient for awhile and the exclusion of other possible sources of hemorrhage. A definite diagnosis was made in one of our cases.

The disease involved the outer end of the right tube in both women and in one only was the ovary also involved.

Histologically the growths presented many papillary masses, consisting of a slim, degenerated core, covered with layers of epithelium of the cylindrical variety. These treelike structures filled the lumen of the tube. The fusion of neighboring branches resulted in the formation of alveolar-like spaces. The histologic diagnosis in both cases was primary papillary alveolar carcinoma.

## SOME STATISTICS OF POSTPARTUM HEMORRHAGE

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THE etiology and treatment of postpartum hemorrhage together with its prophylaxis through proper management of the third stage of labor has always occupied an important place in obstetric literature. The older authors considered it one of the most serious complications met with in midwifery practice and devoted considerable space to the recognition and care of the "floodings of the newly laid woman." In a study of their treatises, one encounters considerable diversity of opinion and much acrimonious debate as to the proper management of the third stage of labor, that is, the most successful method of delivering the placenta and also the most profitable treatment to be used in controlling these "floodings" once started. That these problems cannot be regarded as settled, would seem to be indicated by the large number of articles which still appear each year dealing with the subject. The present investigation was undertaken not only to portray the experience of one clinic over a period of thirty-five years with postpartum hemorrhage, but also because the results obtained under procedures uniformly conservative seemed sufficiently good to warrant examination.

From 1897, when the Department of Obstetrics was established at the Johns Hopkins Hospital, to the end of 1931, 19,290 women were delivered at or near term. In 1,185 instances the delivery was followed by a hemorrhage of 600 c.c. or more, an incidence of 6.14 per cent, or 1 in 16.3 cases.

Table I indicates that postpartum hemorrhage is much less likely to follow premature than full-term delivery, the incidence being once in 38.0 and once in 15.6 deliveries, respectively. It may be stated that the arbitrary classification of prematurity used in this instance includes those infants weighing 1,500 gm. or more, or 35 cm. in length, and under 2,500 gm. in weight or 45 cm. in length.

The table also shows the incidence of hemorrhage of great magnitude. Thus, blood loss of 1,200 c.c. or more occurred once in 104.2 deliveries; 1,600 c.c. or more once in 416.7 deliveries; and 2,000 c.c. or more once in 769.2 deliveries. It is interesting to note that no death due to hemorrhage alone occurred in those 46 women losing 1,600 c.c. or more of blood.

It will be noted that hemorrhage is relatively more frequent in white than in black women. It is also seen oftener among primiparas than multiparas. This last finding was rather surprising in view of the fact that about four-fifths of the cases of postpartum hemorrhage were

clinically due to atony of the uterus, a condition which might be expected to occur in the multiparous more frequently than in the primiparous woman.

It was to be expected that hemorrhage would occur oftener following operative than spontaneous delivery. Table I indicates that such was the case in the series under study, and that operations including

TABLE I. INCIDENCE OF POSTPARTUM HEMORRHAGE

	TOTAL CASES	POSTPARTUM HEM- ORRHAGE	INCI- DENCE PER CENT	
Full-term deliveries	18,035	1,152	6.39 or 1 in	15.6 deliveries
Premature deliveries	1,255	33	2.63 or 1 in	38.0 deliveries
Total deliveries	19,290	1,185	6.14 or 1 in	16.3 deliveries
Hemorrhage 1200 c.c. or more		185	0.96 or 1 in	104.2 deliveries
Hemorrhage 1600 c.c. or more		46	0.24 or 1 in	416.7 deliveries
Hemorrhage 2000 c.c. or more		26	0.13 or 1 in	769.2 deliveries
White patients		674	6.88 or 1 in	14.5 deliveries
Black patients		511	5.38 or 1 in	18.6 deliveries
Primiparas		685	6.49 or 1 in	15.4 deliveries
Multiparas		500	5.72 or 1 in	17.5 deliveries
Delivery spontaneous		951	5.99 or 1 in	16.7 deliveries
Delivery operative		234	6.86 or 1 in	14.6 deliveries
Delivery forceps		137	7.76 or 1 in	12.9 deliveries
Delivery breech extraction		27	5.09 or 1 in	19.6 deliveries
Delivery podalic version		50	13.02 or 1 in	7.7 deliveries
Delivery destructive operation		9	9.18 or 1 in	10.9 deliveries
Delivery cesarean section		11	1.75 or 1 in	57.1 deliveries

intrauterine manipulation are followed by a marked increase in the incidence of excessive bleeding. Thus, podalic version and destructive operations are followed by postpartum hemorrhage in 13.02 and 9.18 per cent of the cases, respectively.

*Maternal Mortality.*—In this series of 19,290 deliveries, 20 deaths occurred in women who had postpartum hemorrhage, giving a gross mortality rate of 0.104 per cent or one in 961.5 deliveries. However, a study of the records in these instances of death reveals that 9 of the patients died from other causes, such as eclampsia, nephritis, pneumonia, and embolism, and that clinically the hemorrhage played little or no rôle in the fatal outcome. This leaves 11 deaths due to actual bleeding, and gives a mortality rate after this correction of 0.057 per cent, or 1 in 1,754.4 deliveries.

A further study of the case records shows that in these 11 remaining cases the fatal outcome in 7 of them was chiefly due to antepartum bleeding, and that in each case the postpartum hemorrhage was less than 1,000 c.c., an amount, however, which was sufficient to cause the death of an already exsanguinated woman. Thus, there were only 4 deaths due strictly to postpartum bleeding, giving a mortality rate of 0.021 per cent or 1 in 4,761.9 deliveries.

Finally, it may be stated that 2 of the remaining 4 deaths occurred in the early days of the clinic following cesarean section, once after the vaginal type of operation, and once after the classical abdominal method. This leaves 2 deaths due strictly to postpartum hemorrhage in women delivered by ordinary means through the birth canal in a series of 19,290 consecutive cases, and leaves a final though highly corrected mortality rate of 0.0104 per cent, or 1 in 9,615.4 deliveries.

The first of these two deaths mentioned above occurred after spontaneous delivery. The patient had suffered from a severe anemia of pregnancy and before delivery the hemoglobin was only 19 per cent. Following the third stage of labor, there was a rapid loss of 1,000 c.c.

TABLE II. A STUDY OF VARIOUS FACTORS WHICH MIGHT PREDISPOSE TO POSTPARTUM HEMORRHAGE

	CASES WITH POST- PARTUM HEMORRHAGE	GENERAL CLINIC POPULATION
1. Age of patient	23.68 yr.	23.80 yr.
2. Duration of labor, para 0	18.23 hr.	17.13 hr.
Duration of labor, para x	12.02 hr.	11.50 hr.
3. Duration third stage of labor	15.88 min.	13.09 min.
4. Multiple pregnancy	2.19 % of cases	1.15 % of cases
5. Toxemia	8.69 % of cases	9.99 % of cases
6. Weight of child, white	3509.17 gm.	3390.70 gm.
Weight of child, colored	3292.67 gm.	3165.37 gm.
7. Weight of placenta	644.45 gm.	598.67 gm.
8. Hydramnios	1.26 % of cases	
9. Myomas	0.51 % of cases	
10. Cervical tears	7.26 % of cases	
11. Perineal tears	52.91 % of cases	
12. Weight of patient, after de- livery	131.47 pounds	

of blood and the patient died six hours later despite restorative measures. The second woman, normal throughout pregnancy, also was delivered spontaneously after a rapid labor. During the third stage of labor, 1,000 c.c. of blood was lost, and there was slight but persistent oozing thereafter. One hour after delivery the patient suddenly collapsed and died. Autopsy showed an extensive cervical tear.

*Predisposing Factors.*—A study was made of the charts of those patients who had had postpartum hemorrhage in an effort to ascertain what factors, if any, might predispose the patient toward serious bleeding. Those factors studied are enumerated and the results are listed in Table II.

The mean age of the patients with hemorrhage was 23.68 years. This, when contrasted with the figure of 23.80 years for the general clinic material, would indicate no connection between the age of the patient and the tendency to postpartum hemorrhage. Some slight effect seems to come from parity, and it has already been stated that primiparas suffer from excessive bleeding relatively more often than do multiparas.

The average duration of labor, both primiparous and multiparous, is somewhat longer in those patients with hemorrhage than without, and the third stage of labor is also somewhat lengthened in them. It is our belief that there is some correlation, though not marked, between the duration of labor, particularly that of the third stage, and postpartum hemorrhage.

Table II shows, also, that the incidence of postpartum hemorrhage, as was to be expected, increased definitely with multiple pregnancy. It seems evident that anything resulting in an increased intrauterine content and hence increased stretching of the uterine fibers tends to result in a greater incidence of abnormal postpartum bleeding. Thus the effect of hydramnios is well known. Additional evidence of this is afforded by the fact that in this series the mean weight of the baby was about 120 gm. more in those patients with hemorrhage than in the clinic population as a whole. Although no figures are available as to the placental dimensions, yet the mean weight of this organ in the cases of hemorrhage was 644.45 gm., or 45 gm. above the figure obtaining for the total clinic. Cervical tears were noted in 7.26 per cent of the cases, and perineal tears in 52.91 per cent, figures in definite excess of those obtaining for the general run of cases.

Myomas of the uterus were noted in 0.51 per cent of the hemorrhage cases, a figure which we feel is not at all high for a clinic 50 per cent of whose patients are of the black race. Likewise, no increased incidence of bleeding was noted with toxemic patients. Finally, although it has been recently stated that the tendency toward excessive bleeding increases with the weight of the patients, it is not felt that this pertains for the present series. The postdelivery weight of those women with hemorrhage was 131.47 pounds and although no comparative figures are available from the general population, it is felt that this weight is not in excess of that pertaining to the clinic as a whole.

In summary, it may be stated that this study indicates three factors predisposing to excessive bleeding after delivery: prolonged labor, particularly an increased duration of the third stage; excessive distention of the uterus as caused by hydramnios, multiple pregnancy, and large children; and increased placental weight and probably extent of attachment of the placenta.

The incidence of puerperal infection is definitely increased in those patients who have had excessive postpartum bleeding. Thus, a temperature of 100.4° F. or above, obtained on two or more days in the puerperium in 24.46 per cent of the hemorrhage series delivered spontaneously; and with operative procedures the rate rose to 39.62 per cent. These figures may be compared with those of the entire clinic where the incidence of puerperal infection, including both spontaneous and operative cases, is 17.10 per cent.

TABLE III. CAUSE OF POSTPARTUM HEMORRHAGE

	CASES	PER CENT
Atony	663	81.15
Tears, cervical	37	5.87
Tears, vaginal or perineal	11	
Imperfect separation	33	6.00
Retained placental fragments	8	
Retained membranes	8	
Placenta previa	15	3.06
Premature separation of the placenta	10	
Hemorrhage with placenta	32	3.92
No cause given	368	
		100.00

*Actual Cause of Postpartum Hemorrhage.*—A study of Table III indicates the clinical impression as to the cause of hemorrhage in the cases under consideration. Unfortunately, owing to defective histories, this could not be determined with any degree of accuracy in 368 instances. In 32 cases, the hemorrhage coincided with placental expulsion and was evidence of improper management of the third stage of labor. Probably all of these cases were preventable. Excessive postpartum bleeding occurred in 25 women whose delivery was complicated by placenta previa or premature separation of the placenta. These cases need no comment except that they serve as a warning that bleeding after delivery is likely to occur and be of grave import in the presence of these two abnormalities.

Roughly, four-fifths of the entire series of hemorrhages were caused by atony of the uterus, and the remainder by lacerations of the birth canal or imperfect or incomplete placental separation.

*Treatment of Postpartum Hemorrhage.*—The best treatment is prevention. By proper management of the third stage of labor excessive blood loss with the placenta should not occur, and those hemorrhages due to "imperfect separation of the placenta" would largely disappear. Even the number of cases clinically due to atony of the uterus would probably be considerably decreased if forcible attempts to produce placental separation were discarded.

A discussion of the management of the third stage of labor and the treatment of postpartum hemorrhage is not within the province of this paper. It is believed that the incidence of excessive bleeding herein reported is about that of the average teaching clinic; nevertheless it is felt that it is too high. The fundus should be constantly watched throughout the third stage of labor to prevent concealed hemorrhage. If bleeding occurs before full separation of the placenta has been effected, immediate attempts at Credé's method of expression should be resorted to. The separation of the placenta is to be left entirely to Nature, and only when this does not occur within a reasonable time (at least an hour), or when bleeding occurs and manual expression is of no avail, is manual removal indicated. It is also believed that routine



inspection of the cervix after all operative deliveries and the immediate repair of any cervical laceration will go far toward decreasing hemorrhage from this cause.

We wish to mention only three points in the treatment of postpartum hemorrhage. In cases of atony of the uterus, where massage and the hypodermic use of pituitary or ergot preparations are of no avail, excellent results will often be obtained by the intravenous injection of  $\frac{1}{2}$  c.c. of pituitrin slightly diluted in normal saline solution, as recommended by Hofbauer. It is also the feeling in this Clinic that tamponade of the uterus, although not to be used without sufficient indication, is a very valuable weapon in cases of stubborn uterine atony. When this is necessary it is recommended that the pack be moistened with 70 per cent alcohol and tightly inserted into the uterine cavity and the vaginal canal by means of the Holmes' packer. This instrument has been found to make the procedure simpler to accomplish, more rapid in execution, and more aseptic. Finally, by the liberal use of intravenous fluids, glucose or citrated blood, it is felt that many lives may be saved in severe cases of bleeding, and also recovery during the puerperium hastened and the incidence of puerperal infection abated.

#### CONCLUSIONS

1. The incidence of postpartum hemorrhage (600 c.c. or more) in a series of 19,290 consecutively delivered women was 6.14 per cent. It was higher following term than premature labors.

2. Hemorrhage occurred relatively more often in the white than in the black women of the series, and was encountered more frequently in primiparas.

3. Excessive bleeding was more apt to occur after operative than spontaneous deliveries, and was most common when the operation required intrauterine manipulation.

4. The gross mortality rate for the series was 0.104 per cent. However, when extraneous causes such as toxemia and pneumonia were ruled out, together with cases of combined antepartum and postpartum bleeding, the mortality rate fell to 0.021 per cent or 1 in 4,761.9 deliveries.

5. Some factors which seemed to predispose the patient to excessive bleeding after delivery were prolongation of labor, particularly its third stage; overdistention of the uterus by hydramnios, multiple pregnancy and oversize children; and excessive weight and probably area of attachment of the placenta.

6. Four-fifths of the cases of postpartum hemorrhage in this series had as their clinical cause atony of the uterus. Cervical or perineal lacerations and imperfect separation of the placenta or retained frag-

ments amounted to 6 per cent each of the total. In 4 per cent of the cases, hemorrhage occurred with the delivery of the placenta and represent instances of mismanagement of the third stage.

7. It is believed that the incidence of postpartum hemorrhage can be greatly decreased by careful watching of the third stage of labor and by employing, in the absence of abnormalities, a "hands off" policy until complete separation occurs.

8. Intravenous pituitrin, uterine tamponade, and the liberal use of transfusion in cases of hemorrhage are three weapons of therapy which are probably not sufficiently employed.

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## AN ANALYSIS OF 200 CASES OF SEPTIC ABORTION TREATED CONSERVATIVELY

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THE treatment of abortions varies widely between ultra-radicalism and pure conservatism, and in consequence, it is scarcely surprising that the medical student enters his early practicing years poorly equipped to treat one of the commonest causes of uterine bleeding in woman during her functional years. Although conservative abortifacient therapy is commonly considered a happier course, it is little emphasized in either gynecologic or obstetric textbooks; in fact, there is noticeably little space given to the treatment of abortions. It is possible that the gynecologist considers all complications of pregnancy an obstetric matter, whereas the obstetrician looks upon its abnormal aspects under three months' duration as a gynecologic problem. The result of this dual management is a probable cause for the comparatively small amount of textbook space emphasizing a definite mode of treatment. According to Taussig, abortions occur in the ratio of 1 to 3 confinements and the death rate is seven times greater than that of confinements, a statistical fact which should certainly bring us to a full realization of the vital need of adequate instruction on abortion in medical schools. It is an easy matter for students or internes on large charity wards, where deaths often pass unchecked or unquestioned, to form habits of radical treatment which might last a lifetime, much to the detriment of successful results in later practice. It is with these thoughts in mind, and after a careful analysis of 200 consecutive septic abortions, conservatively and radically treated, that I add another plea for conservatism in dealing with this problem, which in its daily increase and its various manifestations, demand sure and scientific therapy.

The 200 consecutive septic abortions, diagnosed microscopically, were secured from 2253 histories of abortions in general at Charity Hospital in New Orleans, incidentally showing one septic, or probably induced abortion, to every 11 spontaneous ones. One hundred patients were treated on a gynecologic rest ward on which a conservative form of therapy has been employed for fifteen years, and are grouped under that heading; the other group, which is classed as radical or operative, includes 100 cases in which instrumental interference with the curette for evacuation of the uterus, was employed in addition to some type of anesthesia. The operative cases extend as far back as 1924, while the nonoperative group includes only the last third of 1929 to March, 1932. In general this would indicate that for every 3 cases of septic abortion treated conservatively, there was one on which some type of surgical interference was used.

The 200 cases consist of 142 white patients and 58 colored, with age limits of forty-five and fourteen. The number of white patients is only greater than the colored because the conservatively treated group was taken mainly from the white gynecologic rest division.

A great increase in the white criminal abortions was noted between 1930 and 1931, while the colored induced abortions and the total non-criminal cases for these years remained almost stationary. Such a marked increase, 166 per cent, in the white criminal group might suggest the financial pressure of the present depression brought to bear on this type of charity patient, whereas in the colored the financial element plays a comparatively minor part.

The age decade presents a striking decrease in the percentage of criminal abortions as the age of the patients increases. In the second decade, ten to nineteen years of age, 21 cases, 77.7 per cent, admitted attempted criminal abortion; in the next decade 46 (42.6 per cent) offered the same admission, while 19 (33.3 per cent) and only 1 (1.3 per cent) respectively were found in the succeeding two decades.

Of the 172 married patients, 63 (36.6 per cent) were of the criminal group, while 20 (87 per cent) of the single women confessed criminal attempts at abortion. In this unmarried group the white women outnumbered the colored 4 to 1, a ratio of almost twice that of the whole series. These figures are of interest because of the generally accepted higher incidence of criminal abortion in the white race. The colored temperament, whose background is hard labor and poverty, is generally indifferent to pregnancy, since colored infant mortality still ranges high and the colored child becomes independent more quickly than his white brother, thus freeing its mother from maternal cares.

Setting aside the criminal-noncriminal aspects of these patients, the series, as said before, divides itself into operative and nonoperative groups. If the complaint of chills and fever is taken as an indication for the degree of sepsis of the patient, the conservatively treated group

would appear to have been the more septic on admission since 63 patients out of this class presented these symptoms, while only 25, on whom operation was subsequently performed, offered the same complaint.

The average duration of pregnancy in both groups was about the same, three months; the limits were six months to six weeks. However, there is a striking difference in the relation to the time of abortion. Five of the radically treated patients aborted after admission to the hospital, while 32 of the nonoperative cases passed the fetal and placental parts on the ward. Such a great difference as this could not be coincidence, since the number of abortions before entry was about the same in the two groups. Surely only one conclusion can be drawn and that is, that 25 to 30 per cent more patients in the operative group would have aborted spontaneously if operation had been postponed. The average length of stay in the hospital before operation was performed was 3.8 days.

The physical examination revealed a slightly higher incidence of dilated cervixes and uterine hemorrhage in the nonoperative group. General anesthesia was used in 94 instances, spinal in 5, and local once.

Realizing that  $100.4^{\circ}$  of temperature is generally taken as the level for puerperal sepsis, it was thought best, due to local conditions, to raise the standard to  $101.5^{\circ}$  in order to have no doubt in any cases as to abortal morbidity. The average temperature for both groups was about equal,  $103^{\circ}$ ; however, the duration of the fever in the two groups presented a marked difference. In the operative group the longest duration was greater, the average duration was over three days longer, and even the shortest period of fever in this group was from one to two days more than that found in the nonoperative patients. Likewise the hospital stay, an average of twelve days, was two days longer in the operative group.

Similar to the difference found in the duration of fever, the type of fever reduction offers interesting observations. In the nonoperative group 33 per cent of the cases showed a fall of  $1^{\circ}$  each day as compared with only 14 per cent in the operative class. In other words, 1 out of every 3 nonoperative patients showed a fall of fever of  $1^{\circ}$  a day, while 1 out of every 6 operative ones presented the same response. In both groups however, the number of cases representing a fall of  $1^{\circ}$  every two days,  $1^{\circ}$  every four days, and fever sustained until after the delivery of the placenta was about equal. In the cases with fever prolonged over two weeks, 34 per cent was noted in the operative group as compared to only 11.5 per cent in the nonoperative class. This percentage expressed in another manner, reveals that 1 out of every 3 patients in the operative group presented prolonged fever, while in the conservatively treated cases only 1 out of every 9 showed extended elevation of temperature. Hence, it is readily seen from these figures

that the postoperative convalescence was more stormy and unduly prolonged as compared with the nonoperative, postabortal course.

Thirty-four cases presented exudates, 16 (47.6 per cent) being in the operative group. The average temperature elevation for the cases with exudates was a little lower than that found in the whole series, 102.8° compared to 103°. This finding was contrary to expectation since exudates mean additional pathology which usually gives rise to higher and more prolonged fever. The duration of fever with exudates was definitely longer than that found in the whole series, being 11.2 days against 7.7. The operative group with exudates showed longer duration of fever than the nonoperative, 12.3 in the former to 10 in the latter.

Eighty-five cases were packed, 56 of which were operated upon. The fever in these patients was similar to that noted in the whole series, 103°. The average duration in the packed cases was eight days in the operative group and 5.8 in the nonoperative. The average for both packed groups was slightly lower than that found in the whole series, and definitely so as compared with the cases associated with exudates.

Thirteen operative patients had chills at some period of their illness, while 37 of the nonoperative cases presented the same clinical manifestation. The average elevation of temperature was 103.6° for both groups, but the duration of fever was longer in the operative group, 11.7 days as compared to 5.5. If chills are taken to be an indication of sepsis, the 37 nonoperative patients would appear to have been more septic as compared with the 13 cases in the operative class, yet the shorter duration of fever in the former group, a difference of 5.7 days, or slightly over 100 per cent revealed a more rapid convalescence.

In the pre- and postoperative treatment, the generally greater degree of morbidity is readily seen in the operative group. However, this observation does not mean that such was the case before operation, for on the contrary, as was noted, the nonoperative group, as shown by the chief complaint on admission, presented the greater degree of sepsis in the nature of chills and fever. No nonoperative patient was douched, nor was lavage required in any instance, thus indicating a much smoother convalescence. Contrary to our methods of conservative teaching one of the operative patients was given daily uterine douches, while another had her uterus packed several times. Both patients later developed pyometria, and one subsequently died. If the number of treatments could be totaled in order to contrast the arithmetic difference, the treatments for operative cases would amount to 118 compared to 44 nonoperative ones, a ratio of 2.7 to 1.

The degree of postoperative sepsis was determined by averaging the elevation and duration of the temperature. Sixty-four out of 100 cases were made more septic by operation than they were before operation. Postoperative hemorrhage was brought on in 7 instances and death was

the result in 9 cases. In 19 patients no indication for the operation could be determined from the histories. Only 13 cases were definitely helped by operation as shown by cessation of uterine bleeding, lowering of fever, or amelioration of the general septic condition.

The analysis of the operative and nonoperative complications reveals much more pathology in the former than in the latter group. There were 9 operative deaths, 6 of which were due to perforation of the uterus. It must be remembered however, that abortion was admitted to be criminally induced in 6 of the 11 perforated cases, and the apparent operative perforation of the uterus could have been done initially at the time when the illegal induction was performed, since it was not stated on the chart at what time the perforation was made. Immediate laparotomy was done in 10 cases with suture of the perforation in 9 instances. On one patient hysterectomy was performed, on another the intestine was punctured in addition to the uterine perforation; enterostomy with drainage through the culdesac followed, and the patient died within twenty-four hours. In the 9 cases of laparotomy adnexal operations were performed in 6 instances with no apparent indication from the history charts, and surely with too much operative procedure as death was the final outcome in 3 of the patients. On one patient a perineorrhaphy was even done subsequent to the curettage. Coma was noted in 11 cases, with 9 deaths. Two patients had a second dilatation and curettage performed for postoperative hemorrhage at four- and seven-day intervals after the initial curetting of the uterus. Pyometria was found twice, with one death, while in the 3 instances of pneumonia all patients died. Hemorrhage was equally divided between the two groups, 7 cases each, although there were two deaths from postoperative internal hemorrhage. Nine cases gave evidence of peritonitis after the preliminary dilatation and curettage; 8 patients died. Exploratory laparotomy was performed in 2 instances with no apparent indication as no pathology was found in the abdomen. Lung infarction was noted twice with 2 deaths, while in one case a strip of gauze was left within the uterine cavity for sixteen days before it was discovered; the patient ran a low grade fever during this period. In another case the umbilical cord was broken by traction.

Table I represents the analysis of the deaths. The cause of death was diagnosed in 5 cases by autopsy. The average temperature at operation was  $101.1^{\circ}$ , an elevation of 0.7 of a degree higher than the level,  $100.4^{\circ}$ , generally recognized as sufficient to diagnose puerperal sepsis. The average duration of life after operation was 4.3 days.

A total of 41 doctors performed 102 operations; 2 subsequent dilations and curettages, as was said, were required for postoperative hemorrhage. The 11 perforated uteri were noted in patients operated upon by 9 doctors. In 10 cases one doctor is reported to have penetrated 3 different uteri, resulting in 3 deaths, 2 from perforation, and one

TABLE I. ANALYSIS OF DEATHS

1. Perforation of uterus, with abscess formation; peritonitis; clinical septicemia; lung infarction; pneumonia; autopsy.	Temperature 102° at operation; it rose to 106° and death in four days.
2. Internal hemorrhage; clinical septicemia.	T. 100.5° at operation; rose to 104.5° and death in two days.
3. Perforation of the uterus and prolapsed intestine; enterostomy with drainage through culdesac; peritonitis; autopsy.	T. 100.2° at operation; rose to 105.3° and death in two days.
4. Perforation of the uterus; pneumonia; peritonitis.	T. 101.2° at operation; rose to 105° and death in eight days.
5. Pneumonia, clinical septicemia; lung infarction; peritonitis; autopsy.	T. 100.8° at operation; rose to 105° and death in two days.
6. Perforation of the uterus; bilateral salpingo-oophorectomy; internal hemorrhage; peritonitis; autopsy.	T. 101° at operation; rose to 107° and death in five days.
7. Perforation of uterus; internal hemorrhage; autopsy.	T. 102° at operation; rose to 103° and death in two days.
8. Pelvic peritonitis.	T. 100.5° at operation; rose to 103° and death in thirteen days.
9. Perforation of uterus; bilateral salpingo-oophorectomy; peritonitis.	T. 101° at operation; rose to 106° and death in six days.

from clinical septicemia. Of another doctor's 3 patients, 2 died, one from perforation and one from pelvic peritonitis. Seven doctors were reported to have had 7 perforations and 3 deaths among their patients.

#### TREATMENT

The treatment of septic abortions as carried out on our rest ward is dogmatized here in order to emphasize its conservatism. There will always remain the individual exception, which justly warrants somewhat different treatment, but such cases are infrequent and specific therapy for them is omitted in the hope that a clearer insight into the conservative method may result from the absence of confusing data.

The initial orders are absolute rest under morphine, codeine, or any sedative sufficient to obtain the desired effect. Feeding of a high caloric, low residue diet is advised; the fluid intake is maintained at 3000 c.c. per day and hypodermoclysis is resorted to if any nausea or vomiting is present. Multiple small blood transfusions, 200 to 300 c.c. daily, or every two days, are given without hesitancy in dessication, anemia, or high continued fever.

An initial speculum examination should be made under sterile conditions and any packs, catheters, or foreign bodies immediately removed from the vagina. If remnants of fetal and placental parts are seen protruding from a dilated cervical os, they are gently withdrawn with sponge forceps. However, if no uterine contents are noted, as is the usual case, no attempt should be made to dilate the cervix or enter the uterine cavity. Sterile pelvic examinations should be made every two or three days to note any evidence of complications outside the uterus, or to ascer-

tain the condition of the exudates in the parametrium or broad ligaments. Should any walling off of these exudates take place or abscess formation occur, the prognosis is much better than in conditions in which the exudates remain generalized. Such abscesses rupture occasionally spontaneously either into the bowel, superficially through the inguinal region, or can be drained by a posterior colpotomy. No uterine pack, douch, or evacuation should be necessary as these methods of treatment only tend to spread the infection, and what benefits they might accomplish intrinsically are far outweighed by the greater harm they afford in spreading the disease. The chest should be gone over thoroughly each day as septic patients readily tend toward respiratory infections. A blood culture is generally made in the hospital, but its value lies only in diagnostic and prognostic information.

One-half cubic centimeter of pituitrin, twice a day, and a course of ergot, a drachm of the fluid extract every four hours for 8 doses, is the usual procedure in maintaining uterine muscle tone. Under this régime a severe hemorrhage seldom occurs, and it is rarely necessary to pack the vagina; in fact, packing is never resorted to save in rare or extreme cases of severe bleeding, and this only long enough to tide over an acute emergency until the pituitrin and ergot have acted. Even if bleeding continues and the membranes are completely expelled, a dilatation of the cervix and evacuation of the uterus should not be considered until the temperature has been normal for five days and then, only under the most rigid aseptic technic. Hegar dilators are used on the cervix, while sponge forceps are the safest instrument for emptying the uterine cavity. An iodoform strip is occasionally left in the cervical canal for twenty-four hours if bleeding is slight.

The curette is a dangerous instrument in any pregnant uterus, and has no place in the conservative treatment of septic abortions.

In cases in which fetal and placental parts protrude from a slightly dilated cervix, the uterine cavity is generally empty. As no further uterine contractions will expel this material, and since necrosis and infection of these parts have already begun, the immediate removal of the tissue is indicated. The contents can often be withdrawn manually, otherwise the patient should be placed in the Sims position, the cervix exposed, and the tissue removed from the canal. No packing is necessary as there is usually very little bleeding, because the tissue, having already separated from the uterine wall, is lying free in the cervical os. Fever in this type of case is due to the absorption from the infected and necrotic contents in the cervix, and not from any uterine or broad ligament pathology; hence its removal will tend to bring the temperature to normal and there need be no fear of spread of infection because of the lack of uterine involvement.

It is never safe to pack the uterus, and no vagina should be packed unnecessarily as complete rest and morphine are generally sufficient to control bleeding. Packing tends to further the spread of infection that is already present, especially so in those cases of illegally induced abortion. Normal menstrual bleeding requires no packing, yet many a woman during some stage in abortion has been packed for bleeding not greater in amount than that noted at menstruation. This habit of vaginal packing for mere bleeding, is all too prevalent and suggests the interesting speculation as to whether the doctor or the midwife originated this custom. Hemorrhage alone is the indication for the insertion of a vaginal pack, and hemorrhage can only be diagnosed by inspection of the patient and the amount of blood lost as seen on used pads. However, necessary packing is best accomplished by placing the patient in the Sims or knee-chest position, if the latter be possible, and inserting the pack immediately against the cervix or even a short distance into the canal. When packing is properly performed it helps to dilate the cervix, and often upon its removal, the fetal and placental parts can be immediately withdrawn. The lithotomy position and bivalve speculum do not offer the necessary facilities for accuracy in packing.



## COMMENT

The analysis of the above series of septic abortions is an argument in favor of conservative treatment and it affords a convincing warning against the hasty and unwarranted procedure of intrauterine manipulations, especially the curette, as shown by the operative mortality of 9 per cent, while the amount of pelvic trouble, invalidism, and the possibility of sterility in the future cannot be estimated. Evidence of increased morbidity from operation is less striking than mortality figures, but in such findings lie the origin of future pelvic disease, since patients may be discharged from the hospital apparently cured; but should their general health be followed over a period of months or years, a definite morbidity might be found in the nature of parametrial exudates, infected and torn cervixes, and other chronic pelvic conditions. In the radically treated group in this series, fever unduly prolonged three to four days and stormy postoperative convalescence, as shown by the greater number of packed, douched, infused, transfused, and lavaged cases is appalling in itself, but the multiple complications resulting from operative procedures are an additional plea for conservative treatment. The final testimony against operation is the 64 per cent increase in sepsis, 19 operative cases in which no indication for operations was definitely stated in the history, and, as noted above, the 9 deaths shortly after operation, while only 13 patients were definitely benefited by this procedure. No better evidence than the present analysis could be adduced to confirm the position of the best authorities and teachers of this country that conservative treatment is the only rational and safe procedure to be followed in the management of septic abortions. Much education is needed to bring forth an appreciation of the appalling dangers of radical interference in these cases, and even though an experienced surgeon, whose judgment tempers his actions, may occasionally obtain beneficial results from operation in a few selected cases, the practice of teaching radical treatment to students and internes is extremely dangerous, while the cost of human life and future suffering is inestimable.

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## PREVENTING POSTNATAL LOSS OF WEIGHT IN THE NEWBORN\*

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LOSS of weight in the newborn is sanctioned universally. It is a period of semistarvation during the first days of life that is too stupefying to be ignored, too debilitating to be physiologic, too prolonged to be a sacred law of nature. A century ago Claussius was the first to record the characteristic loss in weight of the newborn. And such is still being recorded apparently without question. Civilization may have perfected the newborn physique but it has simultaneously impaired the maternal milk secretion; it may have improved the methods of delivery but it has not been contributory in combating birth shock of the newborn. The present postnatal procedure of awaiting an ample food supply from the mother is no longer productive of the nutritional adequacy that maintained in primitive times. The modern consequence is an initial period of semistarvation, a condition nonexistent among animals and bushman progeny. Several questions arise in a careful study of this problem.<sup>1</sup> Is the loss of weight in the newborn necessary? Is it detrimental? What is its cause? How can it be prevented? Is its prevention advantageous?

### IS THE LOSS OF WEIGHT IN THE NEWBORN NECESSARY?

The human newborn is markedly underdeveloped for the duration of gestation. Birth involves an abrupt change in the newborn mechanism. It is unprepared for its individualized existence in comparison with other mammals, occupying a place somewhere between the domestic mammal and the wild marsupial. Man appears to be the striking exception in his slow rate of intrauterine development, attaining a birth weight of about a quarter of that developed by other animals. Although the relation between birth weight and gestation time is elastic yet it appears on an analysis of animal species that the larger the animal the longer is its embryonic life. If the birth weight is plotted against the gestation time a straight line relationship is found except for a slight deviation in the case of the heaviest animals. There is some law operative which insures that these limitations necessarily follow.

\*For lack of space, it is not possible to publish the complete article in the Journal. It may be had in the author's reprints.

The time required for the differentiation of man in utero is out of all proportion to all animal species. Yet the product is about a fourth of the expected birth weight because of adjustment to the human female. But this high degree of underdevelopment makes the newborn supervision all the more urgent to meet potential pathology with delicate desideratum.

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Postnatal loss of weight does not occur in animals. The birth process appears to be unrelated to any change in the growth cycle postnatally. Such has been the observation of Scammon,<sup>4</sup> Jackson<sup>5</sup> and others for man and of Donaldson,<sup>6</sup> Lowrey,<sup>7</sup> Schmalhausen<sup>8</sup> and others for animals. An inquiry into weight change in animals after birth or hatching shows that no losses result anywhere comparable to those observed in man. Animal species of all sizes, of varied gestation periods, of all scales in evolution, receiving no scientific supervision after birth or hatching appear to thrive either immediately or at the utmost after the second day of extrauterine life.

This survey of uninterrupted growth after birth of animal species is a revelation of the unique place man holds in his adjustment to environmental forces from the very moment of birth. The transient loss in animals is truly physiologic in that it consists of some skin, hair, amniotic fluid, meconium, and urine. The change represents the irreducible minimum of loss in weight which lasts from an hour to a day since maternal food is already available and adequate for the young. Animals seek the breast immediately after birth and suck continuously unless interrupted by sleep. Even the bushman mother, free from the stress and strain of modern life, is able to nurse her offspring in sufficiency following birth thus minimizing civilization's lag in growth after human birth.

#### WHAT IS THE CAUSE OF LOSS OF WEIGHT IN THE NEWBORN?

Universality of loss of weight in the newborn without exception has glorified the phenomenon into a so-called physiologic law. A century of literature acknowledges the existence of varied attempts at physiologic correlation. Attempts at interpretation of the newborn's loss in weight have led early investigators far afield.

The newborn excretion is neither massive nor unusual, for the sum total of loss due to swallowed amniotic fluid, vernix caseosa, meconium and urine is indeed negligible in comparison with the actual loss of weight during the first days of life. Cammerer<sup>12</sup> demonstrated metabolically that the loss in weight is nothing more unusual than the difference between intake and output. The greater portion of the output is independent of alimentary elimination. It consists of fluid loss from the skin and lungs as insensible perspiration not due to an excessive metabolic rate, but rather to an inadequate total fluid intake to com-

pensate for the newborn's daily requirement. Actually, therefore, the loss in weight is due to some starvation which is never physiologic.

We have initiated our present study as a result of favorable experiences in the nutritional care of prematures. During the first days of life we were able to correct the striking physiologic deviations from the norm by the oral administration of 5 per cent glucose solution reinforced with 5 per cent glycocoll offered every two hours immediately after birth. The glucose consistently alleviated the low blood sugars observed in these premature infants and the glycocoll appeared to raise the internal body heat to a normal level, thus overcoming the low birth temperatures. The continuous administration of the solution the first two days after birth between feedings prevented in a large measure the initial loss in weight which the prematures could not afford. This observation in connection with premature, debilitated and small infants led us to a more careful study for the development of a solution which would be preventive of the initial loss in weight in all newborns.

We have studied the relative merits of complemental feeding immediately after birth with the preliminary administration of a solution for the alleviation of birth shock. We have adduced evidence of the existence of the latter phenomenon and have found it advantageous to offer a solution to combat the shock the first two days and then offer complemental feeding with whatever breast milk that may be available.

*The Solution to Combat Birth Shock.*—The newborn's nutritional requirement can only be fulfilled once he has been alleviated of the symptoms consequent upon the physiologic trauma of birth. We have observed that nutritional therapy is specifically indicated the first two or three days of life before the required normal feeding régime is well tolerated. The actual colostrum intake is small even if valuable and the ingestion of feeding formula minimal under the most favorable conditions. The amount of food consumed in terms of percentage of body weight is less than 1 per cent on the first day, gradually increasing to over 10 per cent of the body weight after the fourth day. This limited intake is a consequence of birth shock. We have therefore found it advisable to prevent initial loss in weight not by forcing feeding mixtures from the day of birth, but rather by the administration of a solution suitable to the physiologic needs postnatally. After a series of attempts to determine the relative effectiveness of various measures we have found solution containing 6.0 per cent gelatin (neutral), 3.0 per cent dextrose, 0.5 per cent sodium chloride, the most desirable for reducing the initial loss in weight of the newborn to the irreducible minimum. It so happens that our favorable clinical observations with this solution have brought out its identity with the gross content of colostrum. This solution was administered to consecutive staff

cases immediately after birth and every two hours thereafter for the first three days when breast milk was supplemented by feeding formula according to the needs of the individual infant.

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Addition of nutrients for stabilizing the water intake in newborns has been adequately met by maximal amounts of gelatin and the minimal amounts of sodium chloride. Gelatin has several physiologic advantages for the newborn, being markedly hydrating, well tolerated and easily assimilable. Sodium chloride, a neutral salt prolongs the retention of ingested water by virtue of the dual properties of the salt, the hydration of the sodium ion and the neutral salt effect. Studies of the blood composition of newborns have shown that the total protein content is at low normal levels in comparison with older children, a further indication for the addition of gelatin. Similarly the sodium chloride content of the blood of newborns has been observed to be at low normal level gradually rising with regain of the birth weight. Hence the justification for addition of minimal amounts of sodium chloride to raise the low plasma chloride concentration. This restores to blood and tissues their normal degree of hydration in view of the absolute relation of this salt to the water content of the body. But the addition of gelatin has another advantage. By virtue of its specific dynamic action it elevates the body temperature, subnormal at birth. And its metabolic products likewise contribute toward the elevation of the blood pressure, lowered as a consequence of birth shock.

Determination of the blood sugar concentration at birth reveals consistently low normal. Therefore dextrose has been added to the solution offered the newborns not only to maintain a normal blood sugar level but as well to offer a readily assimilable carbohydrate, adequate at least for the basal metabolic needs of the body during the first days of life. The entire solution is isotonic because half of the molecular concentration consists of 3 per cent dextrose and the other half of 0.5 per cent sodium chloride. The solution is further made colloidally osmolar by the addition of 6 per cent gelatin which parallels the concentration of the blood. The consistency of the solution warmed before feeding is such as to favor retention thus overcoming the regurgitation so prevalent in young infants.

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*Preparation of the Hydrating Solution.*—To a cup of cold sterile water add about 6 level tablespoons of gelatin (neutral), about 3 level tablespoons of dextrose, and about a level teaspoon of table salt. The gelatin should be free from flavoring, coloring, or sweetening if it is to be well borne as the first nutrient of the newborn. Allow to soak for five minutes. The remaining 3 cups of water required to make a quart of the solution are brought to the boiling point and added slowly to the mixture. The solution is stirred continuously until all is dissolved. This nutrient solution for the newborn consists of 6 per cent gelatin, 3 per cent dextrose, and 0.5 per cent sodium chloride, having a caloric value of 12 calories to the ounce.

*Clinical Course of Treated Newborns.*—Solutions of varying composition were tested clinically for relative effectiveness in preventing loss of weight in the newborn. The soluble nutrients were selected as previously discussed on the basis of the therapeutic needs of the newborn after experiencing physiologic trauma incident to birth. Our studies of nutrition of the newborn indicated an initial requirement in a hydrating solution of a caloric value sufficient to maintain basal needs the first three days of life. Such a solution consisting of well-tolerated substances, gelatin, sugar and salt, brought more rapid recovery from the effects of the birth shock than did the immediate feeding of milk mixtures. In fact, the final, most effective solution offered during the first three days of life actually prepared the newborns for more efficient nursing and utilization of feedings. The solution was given every two hours throughout the twenty-four-hour cycle. The results are expressed in Table I.

TABLE I. EFFECTIVENESS OF VARIOUS SOLUTIONS IN PREVENTING LOSS OF WEIGHT

SOLUTION	CASES	SCHEDULE	INITIAL LOSS (OZ.)	PER CENT LOSS	DAY BIRTH WEIGHT RE- GAINED	PER CENT CASES GAINING WEIGHT
Gelatin 5% Dextrose 5%	15	Q 4 h. X 4	7.6	7.2	7	78
Gelatin 3% Dextrose 3% NaCl 0.5%	17	Q 2 h. X 6	4.7	3.9	6	76
Gelatin 5% Dextrose 3% NaCl 0.5% (P <sub>H</sub> 7.8)	8	Q 2 h. X 6	9.8	8.1	10	60
Gelatin 3% Dextrose 3% NaCl 0.5% Na <sub>2</sub> HPO <sub>4</sub> (P <sub>H</sub> 7.8)	12	Q 2 h. X 6	6.2	4.8	5	92
Gelatin 6% Dextrose 3% NaCl 0.5%	12	Q 2 h. X 6	4.7	3.4	6	96
Gelatin 6% Dextrose 3% NaCl 0.5%	29	Q 2 h. X 12	2.1	1.7	5	100

The final hydrating solution found effective clinically consisted of 6 per cent gelatin, 3 per cent dextrose, and 0.5 per cent sodium chloride. When offered to 12 infants with controls at two-hour intervals during the day, the percentage loss in body weight was no more than 3.4. But when the same solution was offered throughout the twenty-four-hour cycle at two-hour intervals both between and immediately after nursing, the percentage loss in body weight was the irreducible

minimum, 1.7 per cent. The caloric intake exceeded the basal requirement in most newborns and thus tided the baby over the first days of reaction from the birth process. All of the infants began to gain weight on the fifth day of life at a rate which far exceeded that of the controls.

Complemental feeding in 300 control infants merely reduced the initial loss in weight from the usual 10 per cent anywhere from 6 to 9 per cent. The newborns were put to the breast six hours after birth and then continued on four-hour nursing periods with complemental feeding wherever indicated. The actual amounts offered to each baby in varying types of milk mixtures depended on the adequacy of the breast supply. The feedings were offered only after the breast supply was exhausted and continued until the total ingestion of human milk fulfilled optimal requirements in each baby. In common with other observers we have adjusted the complemental feedings without endangering the baby's natural source of nutrition.

The old dictum of Czerny's of not offering newborns any feeding until the breast milk has become available, no longer holds. The basis of that practice was to obviate the development of unnatural and harmful fecal flora; a condition that has never been confirmed bacteriologically. The modern prolonged interval for the development of an adequate supply of breast milk no longer warrants the practice of semistarvation. As a result the enfeebled infants lack the energy to nurse, particularly from engorged breasts. Complete emptying of the breast is in itself the most effective stimulus for milk secretion. The consequence is a vicious cycle with an unnecessarily prolonged adjustment to the optimal nutritional requirement.

Early complemental feeding invigorates the newborn to the extent of obtaining more breast milk, hence it is mutually beneficial in accentuating the most effective stimulus to increased breast flow. Careful regulation of complemental feeding never minimizes effective nursing. But complemental feeding in the 300 newborns observed has not resulted in eliminating the initial loss in weight. Administration of the hydrating solution the first three days between nursings and then complemental feeding with nursing evidently prepared the newborn for rapid adjustment to the required breast and artificial feeding.

TABLE II. INITIAL LOSS OF WEIGHT IN 300 NEWBORN CONTROLS (BREAST AND COMPLEMENTAL FEEDING)

BIRTH WEIGHT	NUMBER OF CASES	AVERAGE INITIAL LOSS (OZ.)	PER CENT LOSS BIRTH WEIGHT (AV.)
9	21	11.8	8.8
8	75	9.6	7.1
7	115	8.0	6.8
6	64	6.2	6.8
5	19	6.5	6.9
4	8	5.9	6.2

The control series revealed a greater loss for larger newborns. Even on complementary feeding 9 pound infants lost on the average about 9 per cent of their birth weight while smaller infants lost less but never below 6 per cent of their birth weight (Table II). The striking advantage of the administration of the hydrating solution was to equalize this variation in postnatal loss of weight to the extent that the average was less than 2 per cent.

The clinical superiority of the newborns who received the hydrating solution led us to favor the latter procedure on the basis of its maximum effectiveness in behalf of the newborn. The considerable fluid intake showed by the newborns receiving the hydrating solution is, of course, paralleled by an increased caloric intake in comparison with the controls during the first critical three days of life. It is to be reiterated that the primary purpose was not caloric adequacy but rather fluid adequacy although it was intended to offer the newborn at least the caloric requirement essential for basal activity, that is, at least 150 calories for the first twenty-four hours (Table III).

TABLE III. AVERAGE CALORIC INTAKE IN TREATED AND CONTROL SERIES

BIRTH WEIGHT (POUNDS)	SOLUTION SERIES			CONTROL SERIES		
	DAYS					
	1	2	3	1	2	3
9	209	235	245	73	116	131
8	142	163	185	86	120	136
7	166	171	225	73	108	120
6	156	188	198	68	116	121
5	163	189	193	—	—	—

Newborns adequately hydrated rapidly lose the so-called physiologic apathy, somnolence, and stupor. Newborns maintained on water the first three days in addition to the inadequate supply of breast milk not infrequently showed acetoneuria. It has already been universally demonstrated that the compensated acidosis of the newborn is an entity which undoubtedly contributes to the familiar newborn apathy. The administration of the hydrating solution effectively cleared this needlessly accepted symptomatology.

Adequate hydration of the newborn freed him from the familiar starvation stools. On the "solution" the meconium stools were larger and more rapidly eliminated during the first three days of life than in the control series from which meconium continued up to the fifth day. Pediatricians have often associated prolonged meconium stool elimination with periodicity of alimentary disturbances. The toxic symptoms which have been found to supervene have made it a practice among many to resort to castor oil. We have observed that such a procedure aggravated the dehydration even though it cleared the transient disturbances. The newborns under observation showed no such upsets and required no special alimentary therapy. Their tem-



peratures were better stabilized in comparison with controls. In fact, the fluctuant temperature variation in the newborn has led many to advance its cause on the basis of an immature temperature regulating mechanism. We have observed the least number of febrile infants throughout the year of this study and none, of course, with dehydration fever.

*Blood Changes in the Treated Newborns.*—Comparative observations of the clinical course of newborns receiving the solution were correlated with blood studies. They involve daily microdeterminations in the nursery of the biochemical changes induced during the first fortnight of life as a result of this procedure. Determination of the daily fasting blood sugar and the sugar tolerance curve indicated the newborn's need and response to readily available carbohydrate. Determinations of the refractive index and viscosity revealed the degree of hydration at birth and its subsequent course after administration of the solution. It further confirmed the hydrophilic state of the plasma proteins. Determination of the clotting and bleeding times daily revealed the relationship between ingested gelatin and blood clotting function.

*Blood Sugar.*—Fasting blood sugar determinations were made daily by the second micromethod of Folin and Svedberg<sup>26</sup> on infants receiving the solution as well as on the controls. Immediately after birth, we have observed uniformly a striking hypoglycemia, the average being 75 mg. per cent. This confirms similar observations made by Schretter,<sup>27</sup> Styrikowisch,<sup>28</sup> Greenwald<sup>29</sup> and Brown.<sup>30</sup> Comparative studies of the fasting blood sugars of newborns of various weights showed no specific correlation. In the control series the blood sugar curve for the first fortnight paralleled rather closely the weight curve. The blood sugar curve fluctuated at low levels decreasing to the low point of inflection with the weight curve between the third and fifth days. It was this apparent relationship between blood sugar content and body weight in the newborn that led us all the more to include dextrose in the solution devised for the prevention of the loss of weight in the newborn.

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*Refractive Index.*—Daily determinations of the refractive indices were made by means of the Pulfrich refractometer. A capillary tube about 6 cm. in length was filled with blood to one level. In order to prevent the blood from being heated during the stated process, it was drawn up into the tube to a distance of a centimeter of the capillary end. The tube was then sealed in a microburner and inserted in a one-hole rubber stopper and centrifuged for about ten minutes under a drop of oil. A scratch was then made with a file at another level, the boundary line of the serum, and the tube broken at

this point. The serum was transferred to the prism of the refractometer and the index of refraction measured at room temperature.

The refractometry of the blood is a very simple method of determining water metabolism. The refractive index of the serum depends largely upon its protein content and concentration changes therein are additive refractively. It has been shown that salts have an inappreciable effect upon the refractive index even if doubled in concentration in the blood serum. Its protein concentration is eight times the salt content and thirteen times that of the organic salts present. Serum protein is therefore the controlling factor, and since it is directly related to the degree of hydration, it becomes a measure of the water metabolism. Already, Rott<sup>32</sup> has shown that the refraction curve is a true mirror image of the weight curve in the newborn.

The refractive index of the treated newborns remained markedly constant throughout the fortnight of stay in the nursery. This refractive stability is indicative of invariant hydration in comparison with the controls. They showed an initial diminution in refractive index (or increase according to the Pulfrich scale), gradually rising as milk or fluids are offered. Determination of the serum instead of the whole blood, of course, obviated the gross error of erythrocyte hemolysis which would be reflected in the refraction determinations.

*Viscosity.*—Blood viscosity is affected by corpuscles in suspension as well as by the proteins according to their degree of hydration. The determinations were made by means of a microviscosimeter provided with a water jacket. The values given for the viscosity of the blood are relative to those of water of the same temperature. We have observed a marked initial viscosity of the blood from two to three times that of the norm. This rapidly decreased to about one-half its initial value on the third day and then gradually veered toward the normal which is five in comparison with water as unity. In view of the rapid erythrocyte hemolysis occurring during the first week of life similar viscosity determinations were made upon the blood serum. Once hydration was maintained by the administration of the solution immediately after birth, the viscosity curve for serum simulated that of the refractive index. But the control group showed a prolonged serum viscosity which approached normal values after adequate fluid intake was established. Comparison of the viscosity curve with that of the refractometry curve in the control series reveals that dehydration of the newborn with high blood viscosity and normal refractive index is indicative of a state of shock during the first days of life.

*Clotting Function.*—Newborns treated with the solution showed diminished clotting and bleeding time values in comparison with the controls. Although these determinations have no direct bearing on blood and tissue hydration in the newborn, we wish to record a favorable effect upon the blood clotting function produced by the gelatin. Rou-

time determinations of clotting and bleeding times initiated in previous years aimed to reveal a prolonged clotting time in the newborn on the first day of life for the early diagnosis of potential hemorrhagic disease. As a result we have previously observed in about 200 newborns an average clotting time of about eight minutes, including several newborns with hemorrhagic disease with clotting times ranging up to 120 minutes. Curiously enough throughout the year of study of newborns for birth shock and the prevention of initial loss of weight, we have not observed a single newborn with hemorrhagic disease.<sup>33</sup>

The average clotting time was reduced for the present series to about three minutes from an initial average of about eight minutes, the lower clotting level assuming constancy after the third day of life. This stability of the clotting mechanism was not observed in the control series. Similarly the bleeding time determination upon the ear lobe remained at the average low level of a little under a minute after the second day of life in comparison with markedly fluctuant bleeding time values for the control series. Blood clotting function can never be evaluated in terms of clotting and bleeding time determination except in the newborn. Cumulative environmental changes affect to no small degree the clotting mechanism and so the newborn, as Sanford<sup>34</sup> has recently confirmed, can safely be studied from this standpoint by simple clinical clotting and bleeding time values as criteria of their tendency to blood.

I have already demonstrated in a series of studies the relation between dietary factors and blood clotting function that protein accelerated the tendency to clot. Likewise, I have been able to prevent hemorrhagic disease of the newborn in a woman who had previously given birth to four babies with the disease, by a dietary excessively high in protein. The mother's blood showed a low prothrombin content which was subsequently found to be characteristic of many of the newborns with hemorrhagic disease. Further work has definitely indicated that high protein ingestion increases the prothrombin content of the blood. Therefore it is reasonable to assume in the present series of newborns studied with the special solution that the gelatin was operative in accelerating the clotting mechanism to the extent that it became manifest in the markedly low clotting time. It is of advantage to newborns to have a diminished tendency to bleed and the ingestion of gelatin brings this tendency to bear.

The consistently low bleeding time values cannot be correlated with the effect of gelatin because it is more directly related to the platelet content which is normal but variant in newborns. Our previous studies, however, have indicated that the administration of gelatin condenses platelets upon the vascular bed and so indirectly reduces the bleeding time. The whole effect of gelatin ingestion during the

first days of life has been to stabilize the blood clotting function in comparison with the control series which reveals markedly fluctuant values day to day.

#### CONCLUSIONS

1. Loss of weight in the newborn is sanctioned universally without physiologic foundation.

2. The newborn is markedly underdeveloped for the duration of human gestation and so requires continuous supervision for the prevention of potential pathology.

3. The neonatal growth gradient continues unaltered during the postnatal period according to analysis of the transitional growth trends of the body as a whole as well as of its tissues and organs; therefore the initial loss in weight is necessarily extrinsic.

4. Postnatal loss of weight does not maintain in animals of all sizes, of varying gestation periods and of all scales in evolution according to a survey of observations of veterinarians, animal husbandmen and curators in experimental and zoologic parks in this country and abroad.

5. The initial loss of weight in the newborn is the result of dehydration and semistarvation, conditions unfavorable for nutritional, physical and environmental adjustments besetting the newborn.

6. Past therapeutic procedures for decreasing the loss of weight in the newborn have not been altogether effective because they were not based on the physiologic needs of the newborn disturbed by birth shock.

7. The initial loss in weight in the newborn can be prevented by the administration of a solution consisting of 6 per cent gelatin ( $P_H$  6.2), 3 per cent dextrose, and 0.5 per cent sodium chloride at two-hour intervals throughout the twenty-four-hour cycle immediately after birth. The gelatin hydrates blood and tissues; it raises body heat by virtue of its specific dynamic action; and reduces the clotting time. Dextrose brings the newborn hypoglycemia to normal. Sodium chloride raises the initial low blood chloride and favors hydration.

8. The average loss of weight in newborns receiving the hydrating solution was 1.7 per cent, the irreducible minimum in comparison with the average loss of 7 per cent.

9. The characteristic clinical picture of the newborn is a result of birth shock, more effectively combated by a hydrating solution than by milk mixtures the first two or three days of life.

10. The total fluid intake of newborns properly conditioned to both breast and bottle was as much as twice that of the series receiving the routine nursery care.

11. Preventing the loss of weight in the newborn produces rapid disappearance of the so-called physiologic apathy, somnolence, and stupor in the newborn secondary to birth shock and the compensated acidosis universally present.

12. Intrinsic differences in the newborns studied revealed that male infants lost more than female infants, that first-borns tended to lose more than siblings, that ward babies lose more than private babies, and that those of Latin extraction lose more than Nordics.

13. The clinical course of the newborns was correlated with daily blood studies of the blood sugar and sugar tolerance curve, of the refractive index and viscosity, of the acid-base equilibrium, of the clotting and bleeding times during the first fortnight of life.

14. Newborns show a hypoglycemia the first days of life and a sugar tolerance curve of low peak thus indicating a dire need for carbohydrate as well as a tendency to utilize, store and exhaust their endogenous supply of carbohydrate more rapidly than older children.

15. Refractive index and viscosity determinations on newborn serum revealed blood concentration on the first days of life gradually attaining normal values following administration of food in the control series; but the newborns treated with the hydrating solution showed a markedly constant course for both refractive and viscosimetric curves throughout.

16. The gelatin component of the hydrating solution decreased the clotting time to less than three minutes in comparison with seven minutes in the control series.

#### REFERENCES

- (1) *Kugelmass, I. Newton*: Clinical Nutrition in Infancy and Childhood, Lipincott, 1930. (2) *Scammon, R. E.*: The University of Minnesota Press, Minneapolis, 1929. (3) *Moulton, C. R.*: J. Biol. Chem. 57: 79, 1923. (4) *Scammon, R. E.*: Proc. Soc. Exper. Biol. & Med. 20: 102, 1922. (5) *Jackson, C. M.*: Am. J. Anat. 9: 118, 1909. (6) *Donaldson, H. H.*: Trans. 15th Intern. Cong. Hygiene 2: 410, 1912. (7) *Lowrey, L. G.*: Am. J. Anat. 12: 107, 1911. (8) *Schmalhausen, J.*: Arch. f. Entwicklungsmech 109: 455, 1927; 110: 33, 1928; 113: 462, 1928; 115: 668, 1929; 123: 153, 1930. (9) *Landois*: Monatschr. f. Geburtsh. u. Gynäk. 22: 194, 1905. (10) *Porak, C.*: Rev. mens. de med. et chir. 2: 334, 1878. (11) *Bakwin, H., and R. M.*: AM. J. OBST. & GYNEC. 18: 863, 1929. (12) *Cammerer, W.*: Jahrb. f. Kind. 53: 381, 1901. (13) *Benedict and Talbot*: Carnegie Inst. Wash. Bull. 22: 233, 1915. (14) *Bailey and Murlin*: Am. J. Obst. 71: 526, 1915. (15) *Grulee, C. G., and Bonar, B. E.*: The Newborn, Appleton, New York, 1926. (16) *Tyson, R. M.*: Arch. Ped. 45: 21, 1928. (17) *Benestad, G.*: Jahrb. f. Kinderh. 80: 21, 1914. (18) *Altheer*: Ueber regelmässige tägliche Wägungen der Neugeborenen, Diss. Basel, 1874. (19) *Kruger*: Arch. f. Gynäk. 7: 27, 1875. (20) *Ingerslav, E.*: Quoted from Berger, C. J., Kopenhagen J. Frimodt 21: 1910, p. 101. (21) *McIlroy, A. L.*: Brit. Med. J. 1: 67, 1925. (22) *Loscaro, T., and Halac, E.*: Rev. de especialid 3: 848, 1928. (23) *Droseel*: Arch. f. Kinderh. 88: 30, 1929. (24) *Eder, H. L., and Bakewell, B.*: Am. J. Dis. Child. 42: 1079, 1931. (25) *Stander and Tyler*: Surg. Gynec. Obst. 31: 276, 1920. (26) *Folin, O., and Svedberg, A. J.*: J. Biol. Chem. 88: 85, 1930. (27) *Schretter and Nevinny*: Ztschr. f. Geburtsh. u. Gynäk. 98: 258, 1930. (28) *Styrokowitsch*: Ztschr. f. Kinderh. 47: 517, 1929. (29) *Greenwald and Pennell*: Am. J. Dis. Child. 39: 281, 1930. (30) *Brown, M. J.*: Quart. J. Med. 18: 175, 1925. (31) *Lindberg, A.*: Ztschr. f. Kinderh. 15: 84, 1916. (32) *Rott*: Ztschr. f. Kinderh. 1: 43, 1910. (33) *Kugelmass, I. N.*: Med. Clin. N. A. 14: 1523, 1931; 15: 1313, 1932. (34) *Sanford, H. N., Gastey, T. H., and Wyat, L.*: Am. J. Dis. Child. 43: 18, 1932. (35) *Kugelmass, I. N., and Samuel, E. L.*: Am. J. Dis. Child. 41: 48, 1932. (36) *Kugelmass, I. N., and Tritsch, J. E.*: J. A. M. A. 92: 531, 1929.

## RUPTURE OF THE CESAREAN SCAR IN SUCCEEDING PREGNANCY\*

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IN THE past few years the broadening of the indications for the performance of cesarean section has resulted in a frequency of rupture in subsequent pregnancy which should give us pause. While we may congratulate ourselves upon the preservation of fetal and maternal life by the performance of cesarean section, this saving of life is not as valuable as it appears on the surface if in later pregnancy both mother and child may be lost as the result of the rupture of the uterine scar. Were it not for this unfortunate incidence of secondary rupture which statistics seem to show to be markedly on the increase, there could be nothing but praise for the present frequency of the cesarean delivery, since in competent hands the immediate mortality and morbidity is as low as in any clean abdominal section; but my experience, together with a very superficial study of the literature, shows that the incidence of secondary rupture in succeeding pregnancies is not infrequent, and therefore it is incumbent upon every obstetrician to be familiar with the signs and symptoms of this tragic accident. Reports in the literature, some of which will be referred to later, show without any question that many obstetricians are not conversant with the symptomatic peculiarities associated with this form of rupture and have no realization whatsoever of the premonitory warnings. Now it is to be emphasized that rupture of the scar of a previous cesarean section considered from the aspect of its signs and symptoms is totally different from the classical form of rupture occurring after many hours of obstructed labor with its ruptured membranes, ascent of the contraction ring and disappearance of the presenting part. In contradistinction it may be here noted that in a goodly proportion of cases of rupture following previous cesarean section the accident occurs either *before labor has begun or very early in labor before the cervix has been obliterated, or at all dilated, and before the membranes have ruptured.* Moreover, it is to be emphasized that the history of the convalescence from the previous cesarean section will give no certain criteria upon which a judgment may be based as to the conduct of succeeding pregnancy. In other words while a bad convalescence from the previous section makes rupture more probable, an afebrile postoperative course with careful suturing of the uterus and healing of the abdominal incision by first intention is no guarantee against uterine rupture in subsequent pregnancy, and it is also to be emphasized that no known method of uterine closure will prevent this tragic accident.

\*Read at a stated meeting of the Obstetrical Society of Philadelphia, March 2, 1933.

The following brief résumé of the eleven cases which form the basis of this paper will, I believe, fully establish the assertions made above. Time will not permit lengthy report of each of these cases; I shall simply refer to the salient points:

CASE 1.—This first patient was seen in my service at the Presbyterian Hospital some fifteen years ago. The diagnosis was early labor. She had been previously delivered by cesarean section and my attention was called to her because her pains did not seem to be normal. In parenthesis it may be remarked that these pains were due to peritoneal irritation but this causation was not recognized, and as her membranes were unruptured, her pulse and temperature normal, and her color perfectly good, I temporized for a couple of hours even though the heart sounds and fetal parts could not be elicited. At the operation two hours later her condition was unchanged, the cervix one finger dilated, not obliterated, no vaginal bleeding, and the uterus could not be differentiated. On opening the abdomen the intact amniotic sac presented itself and the whole ovum was rolled out upon the abdomen without rupture of the membranes. The uterus was found completely ruptured through the old scar and firmly contracted in the left posterior pelvis. Of course this case should have been recognized at once when first seen, as the history and scar of the previous cesarean section, the aberrant pains, the absence of fetal heart sounds, fetal movements, and fetal parts were ample for the diagnosis. I am very glad to say that the diagnosis was promptly made in my remaining five cases.

CASE 2.—Methodist Hospital. The patient had a good abdominal scar. Pain was atypical. Fetal heart sounds, fetal movements and fetal parts were absent. Temperature and pulse were normal. There was no vaginal bleeding, and no blanching of mucous membranes. Cervix was about two fingers dilated and membranes were intact. Mass in left pelvis was the size of a four months' pregnancy; mass on right extended from pelvic brim to liver. Section: Mass on left was firmly contracted completely ruptured uterus. Large mass on right was fetus and placenta in unruptured membranes.

CASE 3.—Presbyterian Hospital. Arrangements were made for patient to have section one week before her estimated date. She was examined three days before date of admission and nothing abnormal found. Two days later sudden rupture of uterus, marked internal hemorrhage and shock, with tense and very sensitive abdomen occurred. Section showed child in unruptured membranes in abdominal cavity but placenta not extruded completely, thus giving rise to the severe hemorrhage as the uterus could not contract firmly.

CASE 4.—This case was seen by the courtesy of Dr. Outerbridge in his service at the Maternity Hospital of Philadelphia. This woman was in bad shape when she was admitted. After her rupture had occurred she was carried by the Police Patrol to a hospital in the northeast part of the city. She was refused admission as she was "a labor case," and was then carried in the same gently undulating patrol to the Tenth and Fitzwater Streets Hospital. When we saw her, there was no question as to the diagnosis and section was performed, but unfortunately, the journey superadded to the uterine rupture, had been too much for her vital forces and she died a couple of days later of exhaustion. In this case there was some rigidity of the abdomen. Operation revealed complete uterine rupture with the child and placenta in the abdominal cavity. The membranes were also ruptured.

CASE 5.—Admitted to the Graduate Hospital. She was six weeks short of term. Eight days ago there was severe sharp pain in upper left abdomen, no vaginal bleeding until last two days. There was increased abdominal pain. Faintness and

nausea occurred on day of admission. No life was felt past two days. Marked abdominal distention with dullness in flanks. Mass in right lower quadrant. No fetal parts or heart sounds. Vaginal examination: Slight bloody discharge, cervix soft and admitting one finger, no presenting part. Section: Rupture occurred through upper part of old scar and the fetus was free in the abdominal cavity. This patient died of miliary tuberculosis two months later.

CASE 6.—The sixth and last of my personal cases was also in my service at the Graduate Hospital. Three years ago this patient had cesarean section at term. Atypical pains occurred for three hours, some bloody vaginal discharge. Pulse was 120. Temperature was normal. Four days ago there was severe pain in left lower abdomen. On day of admission there was severe pain in lower abdomen, marked anemia and decided bleeding from vagina. Cervix was one and a half fingers dilated and not entirely obliterated. Upper abdomen was distended; no fetal parts could be felt. Pulse was 130. Rectal examination showed that the cervix was anterior to a mass in the culdesac. Examination was made under anesthesia: Cervix was empty and the mass in culdesac was a fetal head. Section: Uterus ruptured from bladder reflection upward through the fundus. Uterus was well contracted and but little bleeding from it. The membranes were unruptured. Placenta was just below the liver. The pathologic study on this patient's uterus was made very carefully by Dr. Case, the Pathologist at the Graduate Hospital and a short summary is as follows: "Rupture in anterior uterine wall extended from just above cervix up over the fundus and down on the post surface for a short distance. Scar edges examined microscopically showed increase of connective tissue and on inner surface decidua tissue but no syncytial penetration observed. The specimen showed that the placenta had been attached over the old scar as evidenced by fragments of placental villi with syncytium."

I also report the following five cases which have been contributed by personal communication:

*Dr. R. C. Norris:* A case rupturing at the sixth month; cesarean section was done fifteen months before. There was moderate anemia. The pulse was 124. Temperature was normal, no severe pain. Section showed rupture through the old scar.

Another patient had had two previous cesarean section operations. There was uterine rupture with implantation of placenta over old scar.

*Dr. Collin Foulkrod:* Cesarean section done two years before. Convalescence was stormy. There was rupture of the uterus six weeks premature, after having had pains for five days. Section showed rupture through old scar.

*Dr. Ford A. Miller:* This patient had had a cesarean section done two years ago. She was admitted for cesarean section five days before her expected date. One hour before section mild labor pains began and the scar was found so thin that fetal parts could be seen through it and the upper end was on point of actual rupture.

*Dr. Ely:* Convalescence after previous cesarean section was febrile. Four days before estimated date of delivery she had a few vague pains and on section two hours later a small hematoma was found in the scar and this rapidly enlarged until the whole wound was entirely opened throughout.

#### CAUSES OF RUPTURE

It may be stated without fear of contradiction that one of the most important causes of rupture is the development of the placenta over or in the immediate neighborhood of the old scar. Our reported cases



emphasize this as a fact and in addition the opinions of Freund, Küstner, Steinberg, Abraham, and others give it support. While in my own cases the pathologists were never able to find perforation of the uterine muscle to the serosa by chorionic cells, Küstner, Abraham and Hornung report this finding, the latter stating in addition that there may be such a marked diminution in the decidua, with complete absence of the spongy layer that the placental tufts are brought into intimate contact with uterine muscle, producing an almost typical picture of placenta accreta. This situation of the placenta with the gradual absorption of the old scar by the syncytium explains, I believe, the many cases rupturing during pregnancy without rupture of the membranes or cervical dilatation. However, in many cases of rupture, the placenta is not found on the scar and in explanation of such rupture it is well to remember that a faulty method of wound closure is of great importance, that muscle healing is not favorable at best (what would be the incidence of abdominal hernia after operation if there were no fascia in the abdominal wall?), moreover, endometrial and peritoneal cells may be carried into muscle by sutures at the original operation as suggested by Freund, and a gradual stretching of the connective tissue union of the old wound may occur covering a period of several weeks or months, according to Küstner. My personal belief is that at least in those cases which rupture in pregnancy there is no doubt that the process is a very gradual one as otherwise it is very difficult to explain the many cases in which without pains or cervical dilatation laparotomy shows the child in intact membranes in the abdominal cavity. Such cases are undoubtedly due to placental scar absorption. I would like again to emphasize here that while afebrile convalescence and expert stitching of the uterine wound may make the operator optimistic with regard to a vaginal delivery in the future, he may well be unpleasantly disappointed by a subsequent unexpected rupture. This in no way interferes with the experience common to all men in charge of large hospital services that the very large majority of women who have had a cesarean section may successfully give birth by vagina subsequently, but it does accentuate my firm belief, namely that no man is so prophetically endowed that he can say that any particular woman, the subject of a previous cesarean section, can with safety be allowed a labor and vaginal delivery. The warnings of Winter, Jäger and Küstner meet with my hearty approval when they state that in view of the marked increase in ruptures, the decision for the original cesarean section should be made by the obstetric rather than the surgical mind, that the woman's future pregnancies should be considered as well as the present one, and that the indications for cesarean section should be revised.

The diagnosis of impending rupture depends upon the presence of aberrant pain which may occur at any period of pregnancy but most

usually in the last month and continues from a few hours to several days. This symptom, unfortunately, may be entirely absent until actual rupture has taken place, and when present is usually disregarded by patient and physician. It is well to note that a history of one or more vaginal deliveries subsequent to a cesarean section does not in the least insure against later rupture. This is exemplified by one of my own cases. It cannot be too strongly insisted that the occurrence of pain at any period of a pregnancy subsequent to a cesarean section should be reported at once by the patient and that the physician should not fail to take due cognizance. The diagnosis of actual rupture with or without complete extrusion of the uterine contents is also at times difficult since its presence is compatible as has been said with normal pulse and temperature, an undilated and unobliterated cervix, unruptured membranes, and without signs of internal or vaginal bleeding or abdominal rigidity. The history of aberrant pain in a woman who has a cesarean section scar with absence of heart sounds and inability to differentiate fetal extremities are sufficient for a diagnosis of rupture, however, and of course if in addition a small mass representing the uterus can be differentiated by combined examination from a much larger one, the fetus, the diagnosis is proved.

In partial rupture of the scar or complete rupture of the scar with but partial or no extrusion, anemia develops as an integral part of shock, due to the fact that the uterus not being empty cannot thoroughly contract and thus check bleeding. In cases of complete extrusion of uterine contents, however, the evidence of anemia may be slight. While my personal cases of rupture do not include one in which the previous operation was so-called cervical cesarean, I have nevertheless happened upon a few rather illuminating facts in regard to rupture following this procedure which, as will be remembered, was formerly claimed to be exempt from this accident. Thus Jäger stresses a considerable number of such cases and reports that the cervical scar while possibly less likely to rupture than one high on the uterus, is likely to include the bladder, if rupture occurs, thus complicating the case very seriously, it being stated by Haggenbuch that this accident has a mortality of 60 per cent to 88 per cent, and further that the symptom complex is so indefinite that collapse and bloody urine by catheter are the only sure signs. Jäger emphasizes that the symptoms of this rupture are not found in textbooks. He believes the method of suture in the original section is of importance and that the deep transverse incision is more dangerous than the vertical. Küstner also reports one case of cervical rupture and Loeb has collected thirty cases from the recent literature. Finally, Wetterwald believes that the development of the placenta over the old low scar as in partial or complete placenta previa makes the tendency to rupture decidedly greater.

It is of course obvious that there is but one treatment, namely, abdominal section with hysterectomy or suture according to the exigencies of the case. But there is one caution to be stressed, namely, to err on the side of prompt operation in any case in which there is a suspicion that rupture threatens or has occurred. I was entirely misled in my first case and waited two hours. In a case reported by Hinrichs there was a delay of four weeks, while Jäger reports a five-day period of inaction, and Von Dahl and Sussmann each report a case in which a waiting policy was continued for eight days.

#### CONCLUSIONS

1. The present frequency of the cesarean section operation has resulted in a high percentage of scar ruptures.

2. It is essential that the indications for primary cesarean section should be revised.

3. The diagnosis of threatened rupture depends on the presence simply of aberrant pain in a previously cesareanized patient.

4. Rupture without extrusion can hardly be differentiated early from threatened rupture.

5. Rupture with extrusion of uterine contents shows absent fetal movements and heart sounds, usually the fetal parts cannot be determined but in most cases the contracted uterine mass is differentiable from the much larger fetal body. There is a later development of shock and anemia than in rupture without extrusion.

6. Treatment consists in operation, either hysterectomy or suture. Do not temporize because patient's condition seems good, and do not use pituitrin intravenously as has been advocated in an attempt to decide whether rupture is or is not present, as shown by the occurrence or non-occurrence of pain. Prompt operation in suspected cases of threatened rupture will often save mother and baby. Delay until rupture has occurred of course deprives the child of any chance and seriously jeopardizes the mother.

#### REFERENCES

- Hornung*: Ztschr. f. Geburtsh. u. Gynäk. 95: 580, 1929. *Loeb*: Zentralbl. f. Gynäk. 54: 1930. *Jäger*: Zentralbl. f. Gynäk. 55: 94, 1931. *Küstner*: München. med. Wchnschr. 76: 1929. *Winter*: Zentralbl. f. Gynäk. 53: 1929. *Steinberg*: Zentralbl. f. Gynäk. 50: 396, 1926. *Pokrowsky*: Arch. f. Gynäk. 142: 1930. *Küstner*: München. med. Wchnschr. 76: 1929. *Küstner*: Monatschr. f. Geburtsh. 79: 286, 1928. *Steinforth*: Zentralbl. f. Gynäk. 54: 517, 1930. *Heinrichs*: Zentralbl. f. Gynäk. 55: 1931. *Wilson*: Lancet 1: 404, 1931. *Tottenham*: J. Obst. & Gynec. Brit. Emp. 38: 851, 1931. *Franz, K.*: Gynäkologische Operationen, 1925. *Corda*: Folia Gynaec. 29: 1, 1932.

2023 SPRUCE STREET

#### DISCUSSION

DR. CHARLES MAZER.—The normal tendency of syncytial tissue to invade the myometrium and so weaken the scar of a previous classical cesarean section that a rupture of the uterus often occurs before the onset of labor (when the patient is

distant from immediate help) is an additional argument in favor of the low cervical cesarean section. Despite the fact that a low rupture carries with it the danger of injury to the bladder, it is preferable because the catastrophe occurs during the course of labor when the patient is under observation of her physician and can be treated immediately without considerable loss of blood.

DR. JOHN A. McGLINN.—In the New St. Agnes Maternity Hospital, we meet every month to review the work of the preceding month. If cesarean sections are done, we want to know the indications for them. If a version, high or midforcep operations were done, we very carefully study the indications for these operations.

In other words, if there is no interference with normal labor other than episiotomy and perineal forceps, we desire to have a strict indication to the operation before it is performed.

DR. CHARLES S. BARNES.—I should like to refer briefly to a patient, illustrating the vague symptoms often accompanying these cases.

In the fifth to the sixth month of her pregnancy following cesarean she was admitted under my care. She had no considerable pain (only slight abdominal discomfort), no shock, no acute anemia. However, on keeping her under observation for twenty-four hours, her pulse became moderately accelerated, and it was felt that abdominal section was indicated.

The uterus had opened from fundus almost to the cervix, the fetus enclosed in the amniotic sac lying among the abdominal viscera. There was little or no bleeding. The uterus was sutured, and, at a subsequent pregnancy, it held.

DR. NICHOLSON (concluding).—The question has been asked if the age of the mother has any influence upon the rupture. I do not believe so. Some writers think that the period elapsing between the primary cesarean and the succeeding pregnancy is important from the standpoint of rupture, and they believe that at least a year should pass before a woman who has had a cesarean should again become pregnant. I do not, however, think that this can be supported by the literature. With regard to the period of rupture, I had one case included in my paper in whom rupture occurred at six months; one is reported in the literature as rupturing at the third month, and I have found two or three that ruptured between six and eight months.

Dr. McGlinn speaks of 7 to 9 per cent as a primary mortality from cesarean section. If you add to these deaths the number dying as a result of subsequent ruptures, you have quite a mortality percentage.

In answer to Dr. Mazer I would say that in my paper I did not include ruptures following low cesarean section, but I have discovered in the literature a few rather illuminating facts regarding this matter. For instance, Jäger reports a considerable number of such cases and believes that the low scar, while less likely to rupture than the high scar, is, if it ruptures, much more serious than rupture of the high scar, since it tends to involve the bladder and it is stated that this accident is associated with a mortality of from 60 to 88 per cent. The same author also believes that the method of suturing is most important in the low operation, and moreover that the transverse incision is more dangerous than the vertical.

## PREMATURE RUPTURE OF THE MEMBRANES AND ITS EFFECT UPON LABOR

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THE following study was made on a series of one thousand obstetric cases delivered at the University of Colorado School of Medicine, at or very near term. The membranes ruptured spontaneously in all cases. It differs in these respects from two other similar studies which have been made. Thus the series reported by Schulze,<sup>1</sup> at the University of Southern California Medical School, included all cases of premature rupture occurring after the viability of the fetus, and therefore contained a considerable number of premature labors, while the series reported by Guttmacher and Douglas,<sup>2</sup> at the Johns Hopkins Hospital, were all approximately term cases, but the membranes were ruptured artificially, the rupture being preceded in part of the cases by preliminary administration of castor oil, quinine, and pituitrin, or by the first two alone.

In the present series, the cases were consecutive, in so far as completeness of data would permit, and were composed of 341 primiparas, and 639 multiparas. The membranes ruptured spontaneously before, or with the onset of pains in 166 cases, of which 60 were in primiparas, and 106 in multiparas. The percentage incidence of premature rupture was thus 17 per cent, or about one in six cases. The incidence for primiparas was 18 per cent; for multiparas, 16 per cent. This difference agrees with the findings of Schulze, although it is not as great as she found in her series. An attempt was made to determine the incidence for both primiparas and multiparas below and above the age of thirty, but the number of primiparas above the age of thirty was too small to justify conclusions. However, in multiparas it was found that the incidence of premature rupture below the age of thirty was 14 per cent, while above that age it was 20 per cent. These results corroborate the findings of Bassett,<sup>3</sup> so far as they apply, who found the condition most frequent in young primiparas and in old multiparas.

The average time in labor for primiparas is stated by Williams<sup>4</sup> to be about eighteen hours; for multiparas about twelve hours. These figures are generally accepted. In the series of cases under discussion, the average time in labor for all primiparas in whom the mem-

branes remained intact until after the cervix was dilated was 17.7 hours; for multiparas under the same conditions it was 11.33 hours.

The average duration of labor for primiparas in whom the membranes ruptured before or at the onset of labor was 9.5 hours; for multiparas under the same conditions it was 6.9 hours. Thus in this series the average total time in labor in those cases accompanied by rupture of the membranes before or at the beginning of pains was reduced by 54 per cent in primiparas and by 61 per cent in multiparas.

Even more striking is a comparison of the incidence of abnormally long labors in the two classes of cases. If we use twenty-four hours as the limit within which all labors ought to be completed, it was found that there were only three lasting longer than this in the 166 cases in which the membranes ruptured prematurely, or an incidence of 2 per cent; in the cases in which the membranes did not rupture prematurely there were 80 labors lasting over twenty-four hours, or an incidence of 10 per cent. In other words, labors lasting over twenty-four hours occurred five times more frequently in those cases in which the membranes remained intact than in the cases in which early premature rupture occurred. The cause for the long labors in two of the three cases in the former class was clearly indicated; in one the position was R. O. P., with slow spontaneous rotation and delivery as R. O. A., and the second was a seventeen-year-old Mexican primipara with contracted pelvis. Data in the third case were insufficient for accurate analysis.

Various factors have been assigned as being responsible for the premature rupture of the membranes. The predisposing cause doubtless lies in the development and condition of the membranes themselves. In general, the consensus of opinion is that the most important mechanical factors are those causing overdilatation of the uterus, such as twins and hydramnios, and abnormal presentations, such as breech and transverse presentations and abnormal vertex presentations. In the present series this was found to be probably true. Thus of the factors producing overdilatation of the uterus, 2 per cent occurred in the premature-rupture cases and 1 per cent in the others; there were 4 per cent of breech cases in the former and 2 per cent in the remainder; 6 per cent of abnormal vertex presentations occurred in the premature rupture cases and only 4 per cent in the remainder. Yet, in spite of these factors being greater in the premature rupture cases, the average duration of labor was reduced by over one-half, both in primiparas and multiparas.

The term "latent period" has been used to designate that time elapsing between the rupture of the membranes and the onset of labor. In the great majority of cases it was short, but in 13 of the 166 it was over twenty-four hours. The average length of the latent period

for the entire premature rupture series was 7.6 hours. If we exclude the 13 (8 per cent) which were longer than twenty-four hours, the average drops to 2.9 hours. There were 88 cases, or 60 per cent, in which the onset of labor was immediate. There were 5 cases in which it was forty-eight hours, one of seventy-two hours and three of one hundred and twenty hours.

It would appear reasonable to suppose that in those cases in which the factors responsible for the onset of uterine contractions were so insensitive as to allow days to elapse before labor supervened, they would also operate to produce a very slow labor. However, this was found not to be true.

In only two cases was labor unduly prolonged. In one of the cases in which the latent period was twenty-four hours, the patient was a para iii in whom labor was induced at term because of toxemia, and the interne noted that the pains were poor and infrequent. The other case, with a latent period of 25.5 hours, was a para viii, with pains noted as weak and irregular. Notes such as these were of rare occurrence in the premature rupture cases in this series.

In all, 10 of these long latent periods occurred in multiparas and 3 in primiparas. Of the latter, with latent periods of 48, 48 and 24.5 hours, the durations of labor were 8.5, 4 and 10 hours respectively. In the three cases whose latent periods were 120 hours, the durations of labor were 4, 10.5 and 8 hours; they all occurred in multiparas. Thus it is seen that a long latent period does not mean that the patient will necessarily have a long labor.

The infant deaths for the entire series numbered 26, or 2.6 per cent. The gross mortality for the premature rupture series was 1.8 per cent and for the remainder 2.7 per cent.

This low mortality rate is explainable by the fact first that the series of cases under discussion was a very favorable one from the standpoint of chances for infant survival. They were all approximately at term, which excludes a great cause of neonatal deaths, viz., prematurity, whether spontaneous or induced because of maternal indications, most of the latter of which, particularly the toxemias, are themselves deleterious to the welfare of the fetus. A few cases in which labor was terminated by major operative interference were excluded, since the presence or absence of the membranes was not a factor, and under those conditions the time of labor would not have signified anything. In this class were premature separation of the placenta, placenta previa, anatomic indications for cesarean section, etc. In other words, an attempt was made to have all other factors save the presence or absence of the amniotic fluid as nearly equal as possible. Only on such a basis could a significant evaluation of that one factor be properly made.

An analysis of the three cases of neonatal deaths in the premature rupture cases follows:

Para iii; membranes ruptured twenty-five hours before onset of labor; eight months' pregnancy; normal pelvis; nephritic toxemia; castor oil, quinine, and pituitrin given after rupture of membranes; contractions poor, labor lasting twenty-four hours; baby stillborn, time of death before delivery not definitely known; no autopsy obtained.

Para ii; membranes ruptured twenty-four hours before onset of labor; castor oil, quinine, and pituitrin twenty hours after rupture of the membranes; funnel pelvis; position L.O.A.; duration of labor six and five-tenths hours; baby died one day postpartum; autopsy showed cerebral injury and atelectasis. (In this case, although the latent period was long, since the death was not caused by pneumonia or any infective process, but manifestly by injury during delivery, and that inferentially at the outlet due to a funnel pelvis, it is evident that the premature rupture of the membranes was not a causal factor. The pituitrin might have been.)

Para iv; membranes ruptured immediately before the onset of labor; duration of labor (until the birth of the head) 3.75 hours; mild funnel pelvis; position L.O.A.; delivery began in the home where the head was born, shoulders not delivered until over two hours later in the hospital, baby died in the interim. (Obviously this death was in no way caused by the premature rupture of the membranes.)

In these three cases, then, the second two are ruled out immediately, and there are four possible causes for the stillbirth in the first one, the probable one being prematurity and a toxic mother.

There was only one maternal death in the entire series, and that occurred in the "normal" class. It was of a seventeen-year-old white primipara; the duration of labor was thirteen and one-half hours; fetal position L.O.A. The interne noted that the uterus contracted poorly postpartum and that considerable blood was lost. There was no autopsy, and the cause of death was given as postpartum hemorrhage and shock.

There were three cases of significant maternal morbidity. In all three the onset of labor occurred immediately after the rupture of the membranes, and in all, labor was within normal limits of time. One of the patients had several light eclamptic convulsions twelve hours postpartum, which cleared up immediately. (There was nothing else in this patient's record to indicate an eclamptic state, so it is very doubtful if the condition was eclampsia.) The second patient had a postpartum cystitis, and the third developed a pyelitis. To none of these does the premature rupture of the membranes show any causal relationship, since the onset of labor was immediate and labor was not prolonged, and was entirely spontaneous and normal in all cases. All were in multiparas.

No figures were obtained on the incidence of contracted pelvis in this series, since the internal and outlet measurements were not taken routinely. However, other investigators<sup>5</sup> have not found any significant relationship between this factor and spontaneous premature rupture of the membranes.



Castor oil, quinine, and pituitrin, or the first two alone, were used in 10 per cent of the premature rupture cases, and in only 4 per cent of the intact membrane cases. The reason for this difference is that they were frequently given in the former cases without specific indications, merely because the membranes *had* ruptured, while in the latter, the indications were usually specific, such as "poor pains," "infrequent pains," etc. The duration of labor with and without their use in the cases in which the membranes had ruptured were virtually the same, while in the intact membrane cases, the average duration of labor in the cases in which they were used was almost four hours longer than in the cases in which they were not used. This was to be expected in the latter if the indications were as noted, while the lack of effect in the former cases might be interpreted as meaning that in the absence of the amniotic fluid, labor was proceeding at its maximum efficiency anyway.

It has long been taught, and it is the general consensus of opinion that the rupture of the membranes before the cervix is fully dilated is one of the undesirable complications of labor. The so-called "hydrostatic wedge" has long been considered as the factor making for a gentle and efficient dilatation of the cervix, and its premature rupture has been blamed for a multitude of evil effects. Some of the explanations of these effects rest upon an incorrect consideration of the physics involved, and few of the effects appear to be proved by detailed studies of such cases.

The fact is that very little has been proved concerning the exact mechanism of cervical dilatation, and there is much we do not know regarding the histology of the cervix itself. There is much to be learned before we can fully understand the mechanism of labor, and it is possible that we shall find that the dilatation of the cervix is primarily a process intrinsic in the uterus and cervix, and that the pushing of an object through it from above is not a fundamental part of it.

From the results of this study, which results substantiate those of others<sup>6, 5, 2, 1</sup> who have made similar investigations, I believe the following conclusions are justified:

1. When the membranes rupture before, or with the onset of pains, in term pregnancies, both in primiparas and multiparas, the tendency is toward a short labor, and this tendency is definite and marked.

2. The proportion of long labors in the premature rupture cases is less than in those cases in which the membranes remain intact until the cervix is dilated, and when a long labor is found in the former, factors other than the premature rupture of the membranes are found to be the cause.

3. Premature rupture of the membrane is more frequent in those cases in which there is increased distention of the uterus, and in breech and abnormal vertex presentations. It might be more correct to say that these factors *permit* the early rupture of the membranes.

4. The time elapsing between the rupture of the membranes and the onset of pains is usually quite short. In those cases in which it is delayed, the long latent period does not necessarily imply a long labor.

5. In this series, the premature rupture of the membranes had no demonstrable unfavorable effect upon fetal or maternal mortality or morbidity.

## REFERENCES

- (1) *Schulze, Margaret*: AM. J. OBST. & GYN. 17: 20, 1929. (2) *Guttmacher, Alan F., and Douglas, R. Gordon*: AM. J. OBST. & GYN. 21: 485, 1931. (3) *Basset*: Ztschr. f. Geburtsh. u. Gynäk. 73: 566, 1913. (4) *Williams, J. Whitridge*: Obstetrics, ed. 5. (5) *Bailey, Harold*: AM. J. OBST. & GYN. 16: 324, 1928. *Norris, Charles C.*: AM. J. OBST. & GYN. 19: 500, 1930. (6) *FitzGibbon, Gibbon*: J. Obst. & Gynec. Brit. Emp. 38: 495, 1931. *Rucker, M. Pierce*: Virginia M. Monthly 58: 736, 1932.

707 REPUBLIC BUILDING.

## THE APPLICATION OF A UNIVERSAL JOINT TO OBSTETRIC FORCEPS

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A GREAT many varieties of obstetric forceps have been devised in the past few years. Most of these are modifications of one or two standard instruments. Many of the instruments are useful but the many attempts to modify them are a definite indication of the desire on the part of operators to increase the scope of the instrument in dealing with difficult cases. But with all the modifications we have had very little advance toward the application of any new mechanical principles.

The earlier instruments consisted merely of blades and handles and were not particularly well designed. Their range of usefulness was therefore, very limited. Then the blades and handles were made to lock together. For a long time there was no further advance. Levret introduced the pelvic curve and lengthened the handle. To Tarnier goes the credit of developing the principle of axis-traction. Milne-Murray delved into the mathematics of axis-traction, but with the wide variation in pelves, head sizes and positions, the mathematical deductions are confusing and useless. Barton has developed the principle of the movable blade which undoubtedly extends the range of usefulness of his forceps. Kielland contributed the sliding lock. Beyond these no new mechanical principles have been developed. The only excuse for adding another forceps to the list is to attempt to broaden the scope of the instrument by the introduction of an entirely new mechanical principle.

Many instruments are now available which are perfectly satisfactory for the management of anterior positions. There are several instruments available for the

management of posterior and transverse positions. These, in the hands of expert operators give good results. Nevertheless their range is limited. In dealing with the varied abnormal cephalic presentations, traction is not the only form in which we require assistance. And so to assist in the management of the troublesome group which includes posterior positions, extended heads, asynclitism, and transverse arrests, we seek to introduce to the obstetric forceps the principle of the universal joint.

A manual rotation of a posterior position, for example, is often fairly simple. This is permitted by the universal joint in the operator's wrist. Manual traction on the other hand is obviously out of the question. If we can connect the blades to the shanks of a forceps with a universal joint, we will have an instrument which will imitate the maneuver of manual rotation. With blades designed to permit of an accurate cephalic application, we may perform whatever maneuver we wish and throughout the procedure we maintain our original application. This application is on a line which curves from a point just in front of the posterior fontanel to the chin (Fig. 1), and so is suitable for traction whenever it is indicated.

There are a few difficulties to be surmounted in applying a universal joint to an obstetric forceps. (1) The forceps must split in two and so must the joint. (2)

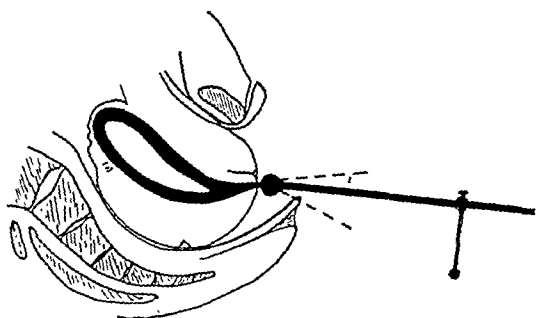


Fig. 1.—Shows blades applied to a head in an anterior position, ready for traction. Broken lines indicate directions in which traction may be changed to suit the particular case.

The joint must be so designed that when the instrument is locked on the head we do not lock the joint movement. (3) At the same time we must lock the two blades together in their proper relationship to each other and so that their movements are synchronized. This is necessary to ensure a proper application and to prevent the blades from slipping.

The joint is designed to fulfill these requirements, but as the obstetrician is concerned only with its operation it is not necessary to explain the mechanical details of construction. Any attempt to do so would only lead to confusion. Suffice it to say that the universal joint successfully installed gives us an instrument that will transmit any force in any desired direction. It is a rotator, a flexor, and an extractor. Thus we move from a rigid instrument, the rotation of which in a pelvis is not without danger, to a flexible instrument which automatically adjusts itself to the various malpositions of the head and to the pelvic axis.

Consider the construction of any of the usual types of forceps. These were designed to fit a head in an anterior position. They consist of blades, shanks, handles and a traction device of some sort. Regardless of the many varieties of such instruments certain requirements have to be fulfilled. (1) The blades must be designed to fit a head. (2) The angle at which the blades leave the shanks is most important to permit of ease in application to the head in the pelvis. These forceps blades are usually described as having a cephalic and a pelvic curve. This is wrong

There is no pelvic curve in the head itself. Then there is no reason, when the blades are smaller than the head, that they should be curved in the direction of the pelvic axis. Blades are designed to fit a head, and all curves in the blades are cephalic curves. The term pelvic curve applied to a blade is a misnomer but its origin is easily understood. Consider a flexed head in an anterior position (Fig. 1). The so-called pelvic curve is really the curve required to sweep the blade from a point just in front of the posterior fontanel to the chin, for it is in this line that we get the most accurate and most useful cephalic application. It so happened that this curve lay in the direction of the pelvic curve and it was so misnamed.

Out of this misconception grew the idea that the pelvic curve in the blade directed traction in the axis of the pelvis. We must not forget elementary mechanics. We

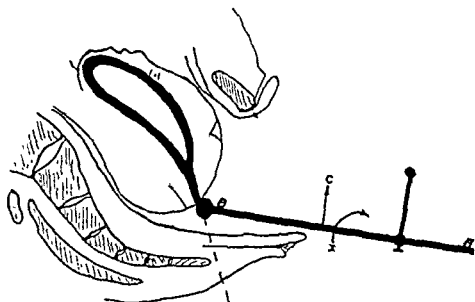


Fig. 2.—Shows blades applied to a head in a posterior position. When rotation is completed, the instrument, without a re-application of the blades, has automatically adjusted itself to the position in Fig. 1.

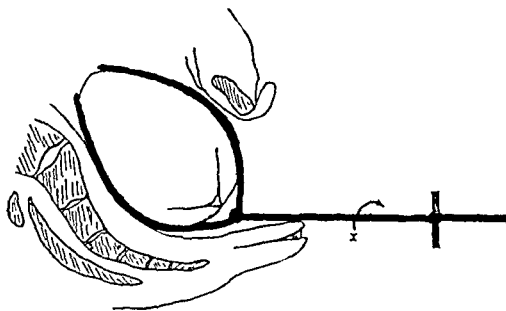


Fig. 3.—Shows blades applied to a head in a transverse position, or to a posterior partly rotated, showing flexion of instrument during the process.

may bend the instrument all we like but the force applied resolves itself into a straight line. The universal joint or any other joint or swivel does not curve our traction force around the pelvic curve. It does, however, enable us to apply our force tangent to the curve of the pelvic axis. That is all we can hope to do and fortunately that is all that is necessary.

Now if we wish to get an accurate cephalic application to a head in a posterior position we would obviously have to put the instrument on upside down. With a rigid instrument this is impossible, for an accurate cephalic application in this position would require the shanks to pass down through the perineum (dotted line Fig. 2).

A head in the posterior position is often extended so this difficulty is increased. The universal joint allows the shanks to bend up over the perineum and at the same time permits of an accurate cephalic application in this position (Fig. 2).

When the forceps is applied to a head in the posterior position the first maneuver should be to increase flexion when this is necessary. It is accomplished by directing a force as shown in Fig. 2. The shanks *AB* are used as a lever. *A* is held stationary in one hand. The force *C* is applied with the other hand. This maneuver will

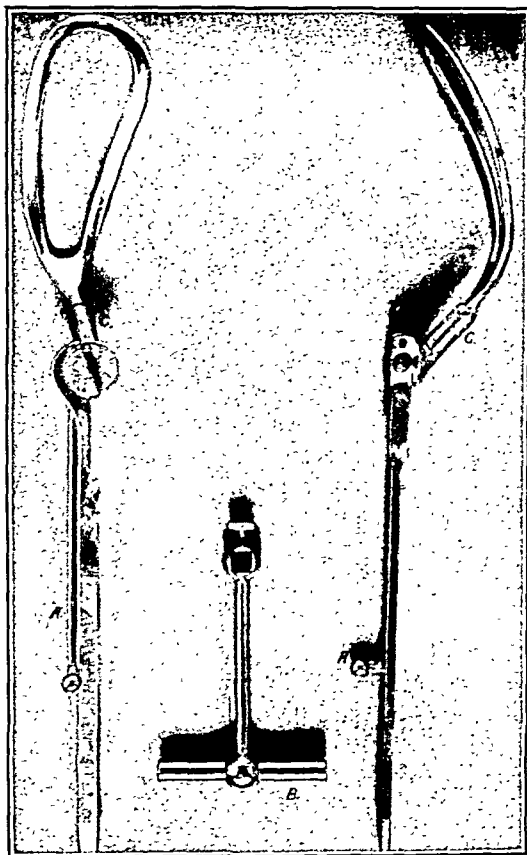


Fig. 4.—Shows the instrument split with the rods *A* applied to lock the joint, making the instrument rigid for application. It would be impossible to accurately apply blades if they moved about on a universal joint.

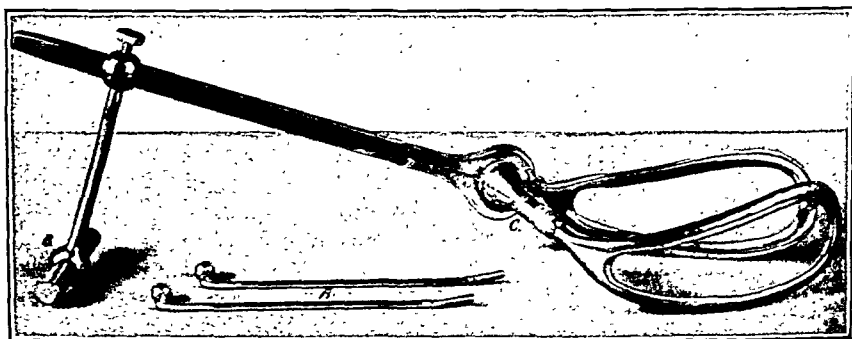


Fig. 5.—Shows the instrument locked in position. Rods *A* are removed to liberate the joint and make a flexible instrument. Traction bar *B* may be placed at any position on the shanks.

tend to raise the head in the pelvis and during this procedure any asynclitism may be corrected. Our next step should try to assist rotation and descent. Spontaneous rotation occurs in many cases. Why it does not occur in others is not the purpose

of this paper to explain. However, a study of cases which do rotate spontaneously shows us that the rotation is accomplished as the head descends. It would then appear reasonable to imitate this mechanism by applying the desired forces to bring about rotation and descent of the head simultaneously.

Whether we attempt to bring about these maneuvers simultaneously or first rotate and then extract depends on the level at which we find the head. If the greatest diameter of the head has not entered the plane of greatest dimensions of the pelvis, it should be made to do so by applying traction while it is being rotated. If, on the other hand, the greatest diameter of the head has descended into mid pelvis, rotation should be completed before traction is applied. If rotation is not accomplished in the plane of greatest dimensions, it certainly cannot be done lower down.

In supplying the rotating force it is only necessary to turn the handle of the instrument to the right or left, as the case may be, through the desired number of degrees, as indicated by the arrow *X* (Figs. 2 and 3). The joint transmits this rotating force into the desired axis of rotation of the head, or in other words, into the axis about which the head would rotate if it could, which of course, is through the line of least resistance. This path of least resistance is automatically found by the universal joint. It simply bends until it finds it. The proof of this is shown by the very little rotating force required. If at the beginning of the operation the head were extended, the flexion and rotation will sometimes raise it and so we may find that after rotation is accomplished the head is at a higher level. This, however, does not make the operation any more difficult, for we still have the original accurate cephalic application of blades, and we are now ready for traction.

As a head has to descend through the pelvic axis, we must have a device that will direct traction in this axis. Some authorities object to the term axis-traction. Nevertheless that is what it is. The only argument is about our method of applying it. It must be understood that hinging traction rods to blades or applying a swivel handle will not of themselves give axis-traction. A perfectly rigid instrument would give axis-traction if the force were properly applied. It may be difficult to judge the axis of traction but the operator must try to estimate the direction in which the force is to be applied. Any hinge or swivel in the traction system merely corrects for error in this estimation. Here again, the universal joint makes this correction, and traction is applied just as with any other forceps.

When the head is found in the transverse diameter, essentially the same procedure is followed. The only difference is that in the original application we have an anterior and a posterior blade (Fig. 3).

The universal joint permits the instrument to be applied regardless of whether the occiput is to the right or left. The cephalic curves of the blades allow an accurate application. The direction of application is determined by the side on which the occiput is found. Again rotation is applied by simply turning the handle as shown by the arrow *X*, Fig. 3.

In dealing with anterior positions, the instrument is applied just as any other forceps. The function of the universal joint here is to direct traction in the desired axis.

Figs. 4 and 5 show the instrument in its present form.

In this instrument a turnbuckle *C* adjusts the blades to variable head sizes. Another model at present under construction and to be described in a subsequent report eliminates the necessity for this arrangement. The blades are being made to automatically adjust themselves to the head size. The principle of the instrument, however, remains unchanged.

The development of the instrument has been done in the Department of Obstetrics, University of Toronto, and in the Obstetrical Division, Service of Professor W. B. Hendry, Toronto General Hospital.

I am indebted to the Algoma Steel Corporation Limited, Sault Ste. Marie, Canada, for permission to work on this instrument in their shops. For expert technical assistance in the machining of the instrument, which I could not possibly have done myself, I am indebted to Messrs. Heywood, Hearne and Roy, of the Algoma Steel Corporation, to Mr. Parkinson of Dr. Best's Department, School of Hygiene, University of Toronto and to Mr. Albert Darbyshire of the Toronto General Hospital.

I also wish to take this opportunity to thank Professor Hendry and the members of the staff at the Toronto General Hospital for their interest and cooperation in the development and application of this principle.

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## A PRELIMINARY REPORT ON THE EVALUATION OF ALURATE (ALLYL-ISOPROPYL-BARBITURIC ACID) AS A PREMEDICATION AGENT IN SURGERY

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IT IS with great interest that one notes the recent literature on the use of the barbiturates in obstetrics and surgery. The advances which have been made in the chemistry and pharmacology of these compounds have led to considerable improvement in the technic of surgical and obstetric analgesia and anesthesia. The sedative hypnotic influence of barbiturates made their administration preliminary to anesthesia very desirable, particularly when surgeons and anesthetists came to realize the great importance to the patient of proper pre-operative care and handling. Rational preanesthesia facilitates the ensuing gas anesthesia and makes the patient more comfortable during the operative and postoperative periods.

Within recent years, pharmacologists have concerned themselves considerably with the study of barbiturates given as anesthetics and preanesthetics. Stormont, Lampe and Barlow<sup>1</sup> state: "One of the most important factors which would govern the efficiency of these compounds (i.e., barbiturates) would be the relative margin of safety, i.e. the ratio between the effective and fatal doses." Again, Barlow et al.:<sup>2</sup> "The barbituric acid derivatives are capable of significantly intensifying the anesthetic effects of nitrous oxide. The use of the hypnotic gas sequence should result in an excellent anesthesia, since the maximal degree of relaxation is obtained in the absence of anoxemia and the patient is entirely free of nitrous oxide within a few minutes after discontinuance of gas administration. Nevertheless, recovery is delayed (eight to twenty-four hours) because of slow excretion or oxidation of the premedication agent. The relative impossibility of adjusting the dosage of the hypnotic to the individual susceptibility of the patient, together with the long postoperative narcosis, constitute in general the most serious criticisms and practical handicaps of such a type of anesthesia. Discovery of an hypnotic of

equal potency with the more effective barbiturates but of a distinctly shorter period of action, would increase the usefulness of the hypnotic gas sequence for anesthesia."

For preanesthesia, the barbiturates are being used in strongly hypnotic, i.e., fairly large doses. Therefore, their selection should be made with circumspection and with regard to their potency, safety margin, quickness and duration of action, oxidation, and elimination. There seems to be a tendency nowadays toward unnecessarily large doses, a practice which one cannot view but with alarm. Unfortunately, this is often the case not only in surgical premedication, but also in routine clinical therapy. The physician should take care not to use barbiturates in greater than absolutely necessary doses, particularly those barbiturates of which the hypnotic dose closely approaches the toxic. Our experience, both experimental and clinical, has shown us that it is possible to use the more efficient barbiturates with very satisfactory results in doses smaller than commonly reported.

For the past five years I have concerned myself with a clinical study of barbiturates and the mode of their administration. I had pointed out at various times the necessity for doing some pharmacologic research work on the effect of barbiturates in nitrous oxide oxygen anesthesia and such work was then started at the Department of Pharmacology, Western Reserve School of Medicine. From the several publications<sup>1, 2, 3</sup> which resulted from these studies, it will be seen that there were considerable differences in the effectiveness of the six barbiturates used in anesthesia experiments on animals. According to Stormont, Barlow and his coworkers, these barbiturates are of two types which "differ very definitely in their therapeutic coefficients ( $\frac{\text{narcotic dosage}}{\text{lethal dosage}}$ ) when administered to rats, both when given for their hypnotic action alone, as well as for intensifying the anesthetic action and lowering the effective concentration of nitrous oxide."<sup>1</sup> Diethyl-barbituric acid (Barbital U. S. P.), phenyl-ethyl-barbituric acid (Phenobarbital U. S. P.) and iso-amyl-ethyl-barbituric acid (Amytal) were found to have lower therapeutic coefficients than, e.g., allyl-isopropyl-barbituric acid (alurate, or in allonal).

The premedication efficiency of the six barbiturates was judged<sup>3</sup> "by the ratio of effective to lethal dosage, the minimal duration of hypnosis to complete recovery and the fewest disagreeable side-actions." Allyl-isopropyl-barbituric acid (later introduced to the profession as alurate) was found to be among the more efficient barbiturates. These experimental results obtained on animals prompted me to subject allyl-isopropyl-barbituric acid to a more extensive clinical study in order to corroborate, if possible, the laboratory findings.

The question of suitable dosage was the first problem which confronted us. Past clinical experience with other barbiturates in gen-



eral permitted an early evaluation of the efficiency of alurate, so that only a small series of cases was needed for the determination of satisfactory dosage. Few drugs, indeed, are apt to produce so much variability in clinical effects as are the barbiturates after the administration of large doses. Our experience with barbiturates had demonstrated the undesirability of high doses. Undesirable side actions, such as delirium and other forms of excitement which may occur with any of the barbiturates, particularly when given in large doses, make anesthesia difficult and may increase the demand for nursing care after operation. The purpose of our preliminary work, therefore, was to determine the average dose necessary to produce a satisfactory tranquilizing effect when alurate alone is used. The sedation should be of such a degree as to make it possible to decrease the required amount of the anesthetic without causing such side effects which would increase the necessity for postoperative nursing care. It was attempted to evolve a method of procedure which would give optimal results with a minimum dosage.

We chose the field of surgical anesthesia for our study, although observations as recorded here could easily be made in the field of obstetrics in which the barbiturates in general are very useful drugs. The surgical procedure has an advantage over the obstetric, as far as the time factor is concerned. As a rule, the prearranged surgery schedule can be closely adhered to, so that the preanesthesia technic can be more easily standardized than is possible in obstetrics.

The administration of alurate by injection for deep anesthesia in surgery and obstetrics has been reported before,<sup>4, 5, 6</sup> but here we were concerned with the use of alurate for preanesthesia medication only. We administered the alurate by mouth, in tablet or capsule form, with a small amount of water, preferably two hours before surgery time. Absence of visitors, a darkened room and quiet were insisted upon as being conducive of better results.

In the first series of cases, we started with a dosage of 3 mg. per kilogram of body weight. Sedation was not sufficient with this dosage. On gradual increase of the dosage, we finally found approximately 10 mg. per kilogram to be the amount which gave the best results. In the beginning, we gave the total estimated dose at once, but soon we became aware of a more satisfactory method of administration.

We determine the total body weight dose and give this in divided amounts, usually one-half on the night before operation and the balance about two hours before surgery. Given in this manner, alurate induces a most satisfactory tranquilizing effect; the patient has a good night's rest, the amount of the anesthetic can be reduced, the incidence of undesirable complications commonly following large doses of barbiturates is greatly diminished and the need for much postoperative nursing care is obviated.

In our cases, there was very little delay in the postoperative return of responsiveness, though this was more apparent with gas than with ether anesthesia. There was little delay, if any, after spinal, sacral, and infiltration anesthesia.

A series of 150 surgical cases was studied at the Cleveland City Hospital where I am conducting further research on the potentiation of barbiturates by opiates. The results of these studies will be reported in a later paper.

A few case reports on our preliminary work may here be given:

Mrs. T. S., aged forty-four, weight 125 pounds, height 5 feet 5 inches. Cholecystectomy. Anesthetic, spinal, 120 mg. novocaine crystals. Night before operation, alurate 4 gr. Morning of operation, alurate 4 gr. at 8:45 A.M. To surgery at 10:50 A.M., patient asleep, atropine sulphate 1/150 gr. Slight reaction upon moving patient. Patient slept through operation. Respirations, pulse, and blood pressure constant. Returned to bed at 12:30 P.M. Good condition. Very drowsy. Reacted at 2:00 P.M. Patient becoming restless. At 2:30 P.M. complained of pain. Morphine sulphate  $\frac{1}{4}$  grain at 2:45 P.M. Uneventful recovery.

Mrs. E. H., aged twenty-six, weight 130 pounds, height 5 feet 6 inches. Ovarian cyst. Night before operation, alurate 4 gr. Morning of operation, alurate 4 gr. at 8:00 A.M. To surgery at 9:45 A.M., almost asleep, atropine sulphate 1/150 gr. Anesthetic, drop ether, volume considerably reduced. Respirations, pulse, and blood pressure constant. Returned to bed at 12:00 noon, unconscious. Reacted at 12:30 P.M. Complained of pain at 2:00 P.M., morphine sulphate  $\frac{1}{6}$  grain. Uneventful recovery.

Mrs. H. T., aged forty-six, weight 125 pounds, height 5 feet 5 inches. Hysterectomy. Night before operation, alurate 4 gr. Morning of operation, alurate 4 gr. at 7:00 A.M. To surgery at 8:45 A.M., very sleepy, atropine 1/150 gr. Anesthetic, drop ether, volume considerably reduced. Respirations, pulse, and blood pressure constant. Returned to bed at 11:30 A.M., unconscious, in good condition. At 12:30 P.M. pulse became thready and respirations became rapid. Adrenalin and intravenous saline given. Prompt response. Reacted at 2:00 P.M. Complained of pain at 4:00 P.M., morphine sulphate  $\frac{1}{4}$  grain. Uneventful recovery.

The observations made with barbiturates in animal experimentation have been substantiated in the clinic. As previously demonstrated on rats, less allyl-isopropyl-barbituric acid (alurate) is necessary to produce satisfactory results than is the case with most other barbiturates. The undesirable side-effects of large single doses of barbiturates may be avoided by administering them in divided doses.

#### CONCLUSIONS

1. Alurate (allyl-isopropyl-barbituric acid) has definite clinical advantages as previously suggested by animal experimentation.
2. The oral administration of the substance, in tablet or capsule form, is a satisfactory method.
3. The optimum dose appears to be 10 mg. per kilogram of body weight (i.e., approximately 1 grain for every 15 pounds of body weight), excessive fat, as in obese patients, to be discounted.

4. A divided dose technic is a rational and satisfactory procedure. Side-actions occur less often than have been reported from large single doses of other barbiturates.

5. The volume of the anesthetic can be appreciably reduced.

6. There does not seem to be any noteworthy delay in the occurrence of postoperative reaction.

7. The need for postoperative nursing care not only is not increased, as reported for some barbiturates, but is diminished in most cases.

#### REFERENCES

- (1) Stormont, M. F., Lampe, I., and Barlow, O. W.: *J. Pharmacol. & Exper. Therap.* 39: 165, 1930. (2) Barlow, O. W., Duncan, James T., and Gledhill, Joseph D.: *J. Pharmacol. & Exper. Therap.* 41: 367, 1931. (3) Barlow, O. W. (with the technical assistance of M. F. Stormont, I. Lampe, James Duncan and Joseph Gledhill): *Anesth. & Analg.* 10: 251, 1931. (4) Fjelde, J. H.: *Anesth. & Analg.* 8: 40, 1929. (5) Axelrod, M. L.: *Anesth. & Analg.* 10: 64, 1931. (6) Hobbs, J. E.: *South. M. J.* 25: 852, 1932.

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### ECZEMA IN PREGNANCY

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WE ARE so accustomed to associate the term toxemia with grave disorders such as hyperemesis and eclampsism that we are apt to overlook the toxic origin of certain minor disturbances of pregnancy. Among these, the various skin eruptions demand special attention not only because they are annoying and potentially dangerous but also because they are, as a rule, recalcitrant to treatment.

To our medical predecessors of a hundred years ago the behavior of the skin was a recognized indicator of the condition of blood and tissue fluids beneath. This view, long discredited as a result of Virchow's teaching, has been revived in recent years. In pregnancy, in particular, skin diseases are now considered in connection with the hormonal and humoral changes which take place in the pregnant organism.

Such a connection is self-evident, for instance, in the case reported by Hebra, of a woman who bore 7 children and, in each pregnancy, had an itching eczema of the hands. Veiel observed a para viii who ever since her third pregnancy was affected regularly in the third month with an eczema of her forearms which always disappeared after labor. Ebert demonstrated a gravida iii of thirty-one years whose first pregnancy had been normal. In the eighth month of her second pregnancy an eruption of multiple erythema type appeared which persisted for two weeks. In her third pregnancy red blotches occurred first on the forearms, and then on the thighs, and later extended to the trunk. At the time of presentation, about the sixth month, the body was covered with many large bullae, some with clear fluid, others hemorrhagic, which caused much itching at times. In the discussion, Driver mentioned the

case of a woman who had a similar, but rather mild eruption in her first pregnancy. In the second pregnancy this erythema recurred in a more severe form, but the patient carried to term, and the dermatosis cleared up in the puerperium. In the third pregnancy the erythema again appeared, but was much more severe and intensive than ever before and involved the entire body. The patient suffered greatly, and as the eruption would not respond to any type of treatment, a therapeutic abortion became necessary. In Tibone's case, a generalized eczema appeared in the eighth month of pregnancy. After induction of labor, rapid improvement took place, and cure was complete without further treatment within three weeks. In a similar case of generalized eczema in the seventh month, recorded by Soli, induction of premature labor after the failure of the customary treatment could not prevent the death of the patient. In this case, both a marked albuminuria and the post-mortem findings clearly indicated the toxic nature of the skin eruption.

The toxic substances which lead to the development or aggravation of eczema in pregnancy are in all probability caused by abnormal changes in the general metabolism, and insufficient elimination. Hence, Seitz recommends a largely vegetarian diet as a means of prevention of dermatoses. Dermatologists seem to incline to the view that even in the nonpregnant state eczema is not invariably due to external irritation but that in some cases it represents an allergic reaction to endogenous irritants which are formed in the intestines either as a result of bacterial decomposition or produced by the digestion of proteins (Burgess).

All authors agree that the usual treatment of dermatoses in pregnancy is highly unsatisfactory.

Mayer inaugurated an entirely new therapy when he injected the blood serum of normal pregnant women in a severe case of herpes in pregnancy. His example was followed with equal success by a number of other writers. Freund attained the same result with horse serum, Lévy-Solal with the patient's own blood, and Bittmann with milk injections. This would suggest that the effect was, in the last analysis, due to foreign protein reaction. Rissmann, however, showed that mineral salts in the form of Ringer's solution could also check the progress of various skin diseases in pregnancy; and his claim has since been confirmed by Roos. This, then, would indicate that some change in the mineral contents of the body in pregnancy reacts upon the vegetative nervous system (Seitz).

Taken all in all, the literature on the subject is not large. In 1927, Seitz could find only 38 cases, including 3 of his own, in which this novel biologic treatment had been employed. These 38 cases, of which 37 resulted in a cure, comprised all sorts of dermatoses in pregnancy, a mild pruritus, erythema or urticaria, as well as the severer forms of dermatitis herpetiformis or the dangerous impetigo herpetiformis.

This scarcity of bibliographic data, therefore, justifies the presentation of the following personal observations.

CASE 1.—A para i of thirty-four years. General and menstrual history were normal. Urinary findings were always normal. Systolic blood pressure on one occa-

sion 106; at all other examinations below 100. Expected date of confinement: Aug. 1, 1922. On August 6, the fetal head was still movable above inlet; hence an attempt was made to induce labor with castor oil and quinine. This attempt was repeated on the two succeeding days, but remained unsuccessful.

Aug. 28, 1922. Patient had been very uncomfortable in the past two weeks on account of a generalized dermatitis herpetiformis with intense itching and pain which had not been relieved by competent dermatologic treatment. Objectively, a very pronounced hydramnios was found; the child, head downward, changed its position frequently. A fourth attempt at induction with castor oil and quinine, reinforced with pituitrin, resulted in frequent contractions, but the head did not enter the pelvis.

Aug. 29, 1922. As no progress had been made in the past twenty-four hours, it was decided, upon consultation, to perform cesarean section immediately, for the following indications: (1) Elderly primipara with relatively overlarge child; (2) confinement long past due; (3) hydramnios; (4) enormous diastasis of recti, indicative of insufficient aid from abdominal muscles; (5) lowered resistance from loss of sleep due to skin trouble.

By cesarean section, a living child, weighing 10¾ pounds, was extracted. The placenta was unusually large, occupying the entire anterior wall of the uterus and extending down into the lower uterine segment (this had been an additional obstacle to the entrance of the head into the pelvis). The amount of amniotic fluid was excessive. The uterus contracted promptly. Bleeding was slight, and patient was returned in good condition from the operation.

After an initial good recovery, patient died from peritonitis four days later. Since no vaginal examinations had been made at any time prior to operation, the infection was obviously due to the fact that the incision had to be made through the diseased skin with its pus-filled vesicles which could not sufficiently be disinfected though particular precautions had been taken.

CASE 2.—A para i, nineteen years old, and in the third month of gestation was first seen Jan. 8, 1932. She had always been in perfect health, except for a dry eczema behind the ears and on the flexor side of the forearms which had existed for about one year but had slightly increased since the beginning of her pregnancy. For this dermatitis she was being treated by a specialist. In spite of very thorough dermatologic therapy, however, the eczema made rapid progress and by June, 1932, had covered almost the entire body. The face was incrustated as if by a mask in such a way that her features were altogether immobile and devoid of expression. She could not even take solid food because opening the mouth caused too much pain. The mammillae and areolae were incased, as it were, in a layer of plate armor; neck, chest, and the entire abdomen were covered by irregularly shaped, scaly efflorescences which exhibited thick crusts in some places, in others bloody or suppurating areas caused by scratching. The process further involved the entire flexor surfaces of both arms and caused so marked a thickening and hardening of the skin that movements of the arms not only were painful but produced deep, transverse breaks in the integument. The eczema also covered the genital region and extended symmetrically and saddle-like across the genitoceural folds to the back of the thighs.

The general condition had suffered considerably because of lack of sleep due to incessant itching and insufficient nutrition. Temperature, blood pressure, and urinary findings were normal and, to mention this at once, remained so throughout pregnancy.

The obstetric problem was this: The eczema overlying the vulva would prevent proper antisepsis in labor and might seriously complicate a delivery through the natural passages. On the other hand, the generally contracted pelvis, though only of mild degree, might conceivably necessitate a cesarean section; and my experience in the first case was a solemn warning as to the consequences of an incision

through diseased skin. Strenuous efforts, therefore, had to be made to clear up the dermatologic condition before the expected date of confinement on Sept. 3, 1932.

Consequently, on June 25 and 28, 200 c.c. of Ringer's solution were injected subcutaneously into the only free areas on the body, namely, below the shoulder blades. These injections which caused no reaction, were followed almost at once by a decrease of itching. From July 1 to 30, seven injections of the serum of normal pregnant women were made in the same areas. The amount of each injection ranged from 20 to 25 c.c., the intervals from one to seven days. The improvement was most impressive. The itching disappeared completely; the crusts became progressively thinner; and on August 1, the eczema had vanished altogether with the exception of a very small patch on the left areola. Faint discolorations on the abdomen still testified to the previous eczematous eruptions, but everywhere the skin was soft and smooth. The general condition showed a corresponding improvement. Sleep was undisturbed, and the weight exhibited an upward curve from the initial 114 pounds to 133 pounds.

For external reasons she received no serum injections during the first three weeks in August; and while her local and general condition remained satisfactory in that time, the eczema on the face returned in thick crusts. Two more injections were given on August 22 and 23, without much change in the facial eczema.

Labor occurred on September 7 and was normal in every respect.

In the puerperium, the crust on the left areola disappeared, so that she could nurse her child without difficulty. The face, however, remained eczematous, but after 4 hypodermoclyses of 200 c.c. of Ringer's solution on four successive days the crusts became distinctly thinner, and patient left the hospital thirteen days after confinement. Metabolism test on the day of departure was -4.

Five days later, however, the eczema returned with renewed intensity on the face, and new eruptions occurred on the shoulders, neck, chest, and the flexor sides of the arms, and even on the tips of the two middle fingers which heretofore had been free. The itching was very troublesome. Five milk injections given within the next week or two failed to relieve the condition. Neither did the weaning of the child and return of menstruation bring about any change.

The patient then consulted a general practitioner who later informed me that he had administered mixed treatment internally (patient was not syphilitic); an ointment consisting of salicylates, mercury, and chlorbutanol externally; and an anti-acid diet. Following this régime the patient was practically cured in less than two weeks.

#### SUMMARY

1. Two cases of severe generalized dermatosis in pregnancy are reported. In one, a dermatitis herpetiformis developed within the last two weeks of gestation, in the other an eczema became generalized in the fourth month of pregnancy. In both, some toxic influence connected with the pregnant state must be assumed though the usual signs of toxemia (hypertension, albuminuria, gastrointestinal disturbances) were absent.

2. Both cases failed to respond to expert dermatologic treatment.

3. In the first case which was further complicated by the age of the patient, hydramnios, postmaturity, and excessive size of the child, an immediate cesarean section became imperative. The patient died from peritonitis which obviously was caused by the infected skin through which the incision had to be made.

4. In the second case, injections of the blood serum of normal pregnant women promptly relieved the intolerable itching and cured the eczema on breasts, abdomen, and vulva. The treatment was supported by hypodermoclysis of Ringer's solution. This patient had a spontaneous labor at term.

5. The method of using blood serum for dermatoses in pregnancy was originated by Mayer, of Tuebingen, Germany, in 1910. Care must be taken to select pregnant donors who are positively free from syphilis and are absolutely normal in every other respect.

6. The fatal issue in the first case and an equally unfortunate outcome in another case in the literature point to the potential danger from dermatoses in pregnancy and call for prompt and energetic treatment along the biologic lines presented in this paper.

#### REFERENCES

- Bittmann*: Zentralbl. f. Gynäk. 48: 1379, 1914. *Burgess*: Arch. Dermat. & Syph. 16: 131, 1927. *Driver*: *ibid.* 510. *Ebert*: *ibid.* 509. *Freund*: Ztschr. f. Geburtsh. u. Gynäk. 70: 684, 1912. *Hebra*: Wien. Med. Wchnschr. 22: 1197, 1872. *Lévy-Solal*: Gynéc. et Obst. 6: 330, 1922. *Mayer and Linser*: Muenchen. med. Wchnschr. 57: 2757, 1910; 60: 1411, 1913. *Rissmann*: Deutsche med. Wchnschr. 38: 1140, 1912. *Roos*: Zentralbl. f. Gynäk. 38: 867, 1914. *Seitz*: in Halban-Seitz 7: 804, 1927. *Soli*: (ital.), abstr. Zentralbl. f. Gynäk. 26: 1037, 1902. *Tibone*, quoted by *Scheuer*: Hautkr. sexuellen Ursprungs, Berlin, Wien. 1911, p. 111. *Veiel*, quoted by *Kroph*: in Nothnagel's Spez. Path. u. Ther. 7: 423, 1913.

METROPOLITAN BUILDING.

## SPINAL ANESTHESIA IN A SERIES OF THREE HUNDRED ABDOMINAL AND PELVIC OPERATIONS

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COINCIDENTAL with the recent revival of spinal anesthesia, it is unfortunate that this valuable adjunct to surgery should as a result of misuse, by those ignorant as to its indications, limitations, and manner of administration, be the target of so much adverse and ill-founded criticism.

A recent article advocating a "New Technic Adaptable to the Beginner," opens with the optimistic statement that "Spinal anesthesia is responsible for more deaths than any other anesthesia, in proportion to the number administered." The "new technic" which is advocated and described, is so much more complicated than any previously advocated, that it would appear on the surface, far more dangerous and less adaptable to the beginner or any one else than any other. There is no doubt that the safest form of therapeutics is that which is based on physiology and which by its simplicity of administration eliminates, or minimizes, the risks incidental to its use. No method, how-

ever, is "fool proof," because its very simplicity of application often induces its use by individuals deficient in training and of questionable ability.

It is not the purpose of this article to discuss the physiology involved in the use of spinal anesthesia. Its object is to report the observations based on its use by the author, in a series totaling 300 consecutive cases in which there was no mortality or any complications remotely attributable to the anesthetic.

In inducing spinal anesthesia, in these cases, attempts were made to use the simplest technic possible, taking into consideration the indications and contraindications to the method, and attempting to use the simplest drugs and avoiding as much as possible combinations of drugs. My experience in these 300 personal cases and observations of many others, convinces me that when properly employed, spinal anesthesia is, if not safer, at least as safe as inhalation anesthesia, having in addition, numerous advantages not possessed by the latter.

During the operation muscle relaxation is more pronounced, minimizing to a great extent, necessity of retraction of incision and manipulation of the viscera. The retraction of the intestine obviates the use of laparotomy sponges, reducing the incidence of postoperative adhesions and postoperative distention. Because of the relaxation, operative time is greatly lessened.

The postoperative recoveries of these patients are smoother than of those having inhalation anesthesia. Nausea and vomiting are infrequent. Distention is lessened. Catheterization of the bladder is not required nearly as frequently, or if used at all, for as prolonged a time as following other methods of anesthesia. Fluids are retained early. There have been no pulmonary complications in this series. Many other advantages could be enumerated, but these appear to be those most important.

In this series the drug used was novocaine crystals (Metz), with the exception of a few cases in which spinocaine was tried, but discarded because it was a composite drug and no advantages were found to justify its administration. The blood pressure was taken before, several times during the operation, at its completion, and at intervals afterward. The fall in blood pressure was found to vary in different individuals, irrespective of the dosage of the drug, or of the height of anesthesia. The duration of the lowered pressure also varied greatly. In some cases it started to rise twenty minutes after administration of the drug; in others not for one or two hours. Early in the series ephedrine was used in one cubic centimeter doses, ten minutes before anesthesia, in an attempt to prevent the fall in blood pressure. While it appears that this prevented the blood pressure from dropping to as great an extent as in those in which it was not used, a surprisingly large number of individuals were found who appeared to react



unfavorably to the ephedrine so that in the later and large majority of cases, all vasoconstricting drugs were eliminated. Subsequently no attention was paid to the drop in blood pressure, many patients showing a pressure as low as 60 mm., systolic. Reliance was placed entirely in the Trendelenburg position for the prevention of cerebral anemia.

My observations lead me to be fully in accord with those of Labat to the effect that a fall of blood pressure should cause no worry if the correct technic has been used. I have ceased to take the blood pressure readings except as a matter of interest and at the present time, feel that the Trendelenburg position is the only necessary safeguard, no vascular stimulants being required or administered.

In the earlier cases puncture with the spinal needle was preceded by anesthesia of the skin and subcutaneous tissues with novocaine. Conversation with patients who had had this done and who afterward received another spinal anesthesia without the preliminary anesthesia of the skin, convinced me that this was unnecessary. They invariably stated that there was very little difference if any, in the amount of pain as caused by one puncture as compared to the other. This was then discontinued.

TABLE I. SUMMARY OF CASES

NO. OF CASES	OPERATIONS	NOVO-CAINE CRYSTALS	SPINO-CAINE	SUPPLEMENTED BY N <sub>2</sub> O	EPHEDRINE (EARLY CASES ONLY)	FAILURES
188	Abdominal Operations on Pelvic Viscera	171	19	6	19	2
25	Combined Vaginal and Abdominal Operations	25	0	0	0	0
24	Appendectomy	21	3	1	6	1
29	Plastic	29	0	0	0	0
1	Resection of Ascending Colon (Carcinoma)	1	0	0	0	0
20	Dilatation and Curettage, Biopsies, Radium	20	0	1	1	0
3	Cesarean Section	3	0	0	0	0
3	Cholecystectomy	3	0	1	0	0
3	Therapeutic Abortion	3	0	0	0	0
4	Vaginal Hysterectomy	4	0	0	0	0
300	Total	278	22	9	26	3

Maximum dose of Novocaine, 200 mg.

Minimum dose of Novocaine, 50 mg.

Maximum amount of fluid withdrawn, 8 c.c.

Minimum amount of fluid withdrawn, 3 c.c.

Average amount for all cases, 4 c.c.

Average fall in blood pressure, 60 mm. of mercury.

Lowest pressure recorded (systolic), 35 mm. of mercury.

Complications, none.

Deaths, none.

#### TECHNIC

In cases of emergency, preliminary treatment consists in the ingestion of 3 gr. of sodium amytal by mouth, when no nausea was present, followed immediately by  $\frac{1}{16}$  to  $\frac{1}{4}$  grain of morphine and  $\frac{1}{150}$  to  $\frac{1}{200}$  of hyoscine by hypodermic, depending on the size, condition and temperament of the individual. When nausea was present, the latter only was used. When possible the drugs were given one-half hour before operation, so as to relieve the apprehension and anxiety of the patient.

Other cases were given the usual preoperative preparation and except when contraindicated, received an enema and when indicated, an antiseptic douche the evening preceding and again the morning of the operation. No laxatives were used, and the majority of patients were allowed soft diet the day preceding operation and small amounts of liquids the morning of the operation. The evening preceding, the patients were given 6 gr. of sodium amytal by mouth; 3 gr. were given the following morning, approximately two hours before operation and one-half hour before,  $\frac{1}{6}$  to  $\frac{1}{4}$  gr. of morphine and  $\frac{1}{150}$  to  $\frac{1}{200}$  gr. of hyosine. The majority of patients reached the operating room in a somnolent condition and although able to answer questions and obey instructions a large number did not recall being taken to or from the operating room.

The patients are catheterized on the operating table after which they are turned on their side, either side; instructed as to the manner of arching their backs by a nurse assisting and standing in front of them. An extensive area about the place of puncture is painted with tincture of iodine, the spinous processes are palpated and that interspace which is deemed most accessible is selected as the point of injection. This varies greatly in different individuals, usually however, being the third or fourth lumbar interspace. The patient is told that the initial puncture might hurt slightly and is cautioned against moving. The spinal puncture needle, a 45 degree bevel, size 22, is introduced rather quickly through the skin at right angle to the plane of the back after which it is pushed in gently until the click afforded by its passage through the dura is felt. The stylet is then withdrawn and if no spinal fluid issues, the needle is gently rotated and if necessary pushed in slightly farther. Care is taken not to push in the needle to the point of striking the vertebrae. If blood should flow with the puncture, the first few drops of fluid containing it are discarded. If it persists after gently manipulating the needle, the latter is withdrawn and introduced at a higher level. The persistent presence of blood is considered a definite contraindication to further attempts.

The spinal fluid is allowed to drop directly into the ampule of novocaine crystals, although at times it has been aspirated into the syringe. Approximately 3 or 4 c.c. are collected in this manner and the stylet replaced. In my series of cases, it was found that postoperative headaches are more apt to occur if an excessive amount of spinal fluid is lost; so care is taken that none other than that which is absolutely unavoidable is spilled. The spinal fluid is mixed with the novocaine crystals by means of a large gauge needle fitted to a 10 c.c. glass syringe. When this is completed, the air bubbles are expressed, needle removed, and after removing the stylet the syringe is fitted closely and gently to the needle. The spinal fluid is gently aspirated, the amount withdrawn depending on the level of anesthesia desired. After this has been reached, it is slowly and gradually reintroduced with or without barbotage. The latter is used more for purpose of assuring oneself that the fluid is flowing as it should into the canal, rather than for the purpose of influencing the level of anesthesia, which it does not appear to do.

When the injection is completed, the needle and syringe are quickly withdrawn, in one motion, a gauze sponge applied for a few seconds to the point of puncture and the patient immediately placed in the Trendelenburg position. This position, considered the most important safeguard against cerebral anemia, is maintained during the entire operative procedure. The patient is returned to her room on a special carriage in this position, which is maintained in bed for a minimum of three hours, after which the Fowler or any other desired position may be assumed.

The dosage of the drug varies with the duration of anesthesia desired. The minimum dose used has been 50 mg. and the maximum in any case, 200 mg. with the average dosage of 150 mg. In none of the operations was the time required over one hour and forty-five minutes and a dose of 150 mg. was ample in producing

anesthesia of that duration. The maximum dosage of 200 mg. was only used in large, obese individuals, in some combined perineoabdominal operations, or when difficulties were anticipated.

The level of anesthesia was controlled by the amount of spinal fluid withdrawn in the third or fourth lumbar interspace; the maximum being 8 c.c. for operations on the upper abdomen, gallbladder, intestines, etc., and a minimum of 3 to 4 c.c. for operation on the perineum or on the uterus by the vaginal route.

Although it is admitted that other factors may influence the diffusion of novocaine in the spinal fluid, such as those in the specific gravity, speed of injection, gravity as influenced by the position of the patient, and cerebrospinal fluid pressure, my experience convinces me that as a matter of practical application in controlling the height of anesthesia, only the amount of spinal fluid that has been withdrawn need be considered. After introducing the solution, from five to ten minutes are required for complete anesthesia. At the end of this time, the power of sensation is tested by use of an Allis clamp, the incision being of course deferred until it is definitely ascertained that anesthesia is complete.

During one period, in three of my own patients and in four other patients at the hospital, there was either partial or complete failure of anesthesia, necessitating supplementary inhalation anesthesia. The technic having been checked very carefully, this was thought to be possibly a result of deterioration of the drug and correspondence was entered into with the manufacturers, but inasmuch as by that time that entire shipment of novocaine had been used and none therefore available for examination, it could not be ascertained wherein existed the difficulty. There have been no other failures in this particular series, although it is admitted that in the absence of faulty technic, they can and do occur, probably as a result of individual idiosyncrasy to the drug used.

In a few instances in highly nervous individuals, where the preliminary sedatives had apparently failed to take effect, although local anesthesia was perfect, it was supplemented by a small amount of inhalation anesthesia; usually nitrous oxide and oxygen.

In this small series of cases there have been no deaths and no complications. Many of the patients who had had operations under other forms of anesthesia, voluntarily stated that in their opinion, this was superior to anything they had had and if again required, from their personal standpoint, would be their method of choice. A graphic summary of clinical cases is attached hereto.

Contraindications with the exception of a few arbitrarily definite ones, are more or less elastic, depending to a large extent on the judgment and experience of the operator.

Definite contraindications can be summarized as follows:

1. Diseases of cerebrospinal system.
2. Suppuration at or about the site of puncture.
3. Sepsis with positive blood cultures.
4. Cardiac decompensation when high anesthesia is contemplated.

Relative contraindications are shock, profound anemia, extreme hypertension, delirium, highly nervous and sensitive individuals. The majority of the latter group can be influenced by proper adjunct measures.

The safety of spinal anesthesia rests almost entirely on the experience of the man using it. This implies not only skill in technic, but familiarity with general principles on which it is based; a clear conception of the nature of the mechanism affecting its clinical results and an observance of the requirements governing the safe operation of this form of anesthesia.

#### CONCLUSIONS

Mortality from spinal anesthesia is undoubtedly the result of faulty technic in a large percentage of cases and the prevention of fatalities can be briefly summarized into the following principles.

1. The use of a simple drug dissolved in cerebrospinal fluid, in this particular series, novocaine crystals.

2. The avoidance of all complicated technics and use of proper technic by competent individuals.

3. Most important, the use of the Trendelenburg position immediately after the injection and maintained for a sufficient period afterward.

4. Observance of common sense requirements as to the selection of patients, as it is not applicable to all; not only because of existent contraindications but because of psychic factors involved.

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#### AN ANALYSIS OF 200 CASES OF SPINAL ANESTHESIA\*

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SPINAL anesthesia up until ten years ago, has been used extensively in but comparatively few clinics. Today, however, with better technic and proper selection of cases, this procedure is much safer and widely used. As yet, we have found no one ideal anesthetic, satisfactory in all types of cases, therefore we must choose one that is consistent with the greatest safety to the individual undergoing operation.

Our technic, as employed in the present series of cases, is that advocated by Dr. Labat, with slight modifications. Neocaine and spino-caine were equally employed. We found very little difference in

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\*Read at a meeting of the Obstetrical Society of Philadelphia, March 2, 1933.

effects between the two. My personal preference is for neocaine because the pure crystals are dissolved in the spinal fluid which is less likely to irritate than other solvents.

In analyzing our 200 cases, we find that age in itself made very little difference. The youngest patient was fourteen years and the oldest sixty-eight. The largest number of patients were between fourteen and thirty-nine years of age.

In regard to blood pressure, we have noted that the hypertensive cases furnish the largest number of bad reactions. There were 170 patients in our series who had a blood pressure varying from 100/40 to 150/100; 17 showed a systolic pressure under 100; the remaining cases were hypertensive with a systolic pressure ranging from 150 to 210. Of the patients having a systolic blood pressure above 150, one-third had bad reactions requiring stimulation. With this experience in mind, we have followed a general rule, that in patients with a systolic pressure below 100 or over 160, we do not use spinal anesthesia. We feel that hypertensive patients react badly to the sudden drop in pressure due to the less resilient arterial walls.

One hundred and thirty-six patients or 68 per cent of the group required no complementary anesthesia. In 52 of the 64 cases which did, the effect of the spinal anesthesia wore off at the end of fifty minutes; in the remaining 12 the anesthesia was incomplete from the beginning. When supporting or complementary anesthesia was needed the amount required was usually small and relaxation complete. Voleker<sup>1</sup> of Berlin in his survey of 500 gynecologic patients under spinal anesthesia, states that only 10 per cent of his patients required inhalation anesthesia in support of the lumbar anesthesia.

We are in the habit of giving 5 to 15 minims of adrenalin hypodermically, as a stimulant whenever the systolic blood pressure drops below 80. In our series, 24 or 12 per cent of the 200 cases required stimulation; of this number one-third were in the hypertensive group.

The cases may be divided into several groups of which the first comprises four cesarean sections. Nothing unusual happened in this group. However, we abandoned spinal anesthesia in cesarean section because of the bad results reported in the literature. One spinal death during a cesarean section occurred on one of the other services of the Mt. Sinai Hospital. Winter rejects spinal anesthesia for this operation. Voleker<sup>2</sup> also feels that spinal anesthesia should not be employed, especially when there are distinct labor pains.

The second group includes 37 plastic operations. Only two of this group were given supplementary anesthesia, both requiring one and a half hours to complete the operation. We have been very much pleased with results in this group. The patients are not "washed out" as with general anesthesia in prolonged operations. As mentioned earlier in the paper, we are using now only one-half the usual dose with excellent results. Only one patient in this group required stimulation with adrenalin; the blood pressure in this case was 210/100.

The third group consists of 17 combined plastics and sections. Two patients

required stimulation, both had a systolic pressure below 100. Nine of these patients required supplementary anesthesia because it took more than one hour in each instance to complete the operation.

The fourth group embraces 13 unruptured ectopic gestations. One needed stimulation; 4 required supplementary anesthesia. No other complications were noted in this group.

The fifth group consists of 10 urologic cases, 7 of which had nephrectomies performed. Only 1 required stimulation; this patient had a blood pressure of 174/100. No other complication was noted.

The sixth group, the largest of the series, comprises 120 abdominal sections, including simple appendectomies, myomectomies, hysterectomies, ovarian cysts, and pelvic inflammation. Forty-two in this group required supplementary anesthesia. Of this number 29 needed more than one hour to complete the operations.

The complications following spinal anesthesia in our series were (1) upper-respiratory infection, (2) postoperative headache, (3) vertigo, (4) backache, (5) vomiting, and (6) distention.

We were fortunate in having only 4 cases of respiratory complications. One patient developed atelectasis on the second postoperative day. It cleared up spontaneously in two days. Three patients developed upper respiratory infection, pleurisy in 1 and pneumonitis in the remaining 2. No neurologic complications were noted in our series. Headache as a postoperative complication was noted in only 2 cases or 1 per cent, which is in accord with Volcker's findings. Vertigo was noted in one case and severe backache in another. One of the most satisfactory results of spinal anesthesia is the freedom from postoperative distention and vomiting which are so common and annoying after inhalation anesthesia. In our series of 153 abdominal operations, only 6, or 4 per cent had marked vomiting and abdominal distention after operation. Fifteen patients or 10 per cent had slight vomiting. Twenty-eight or 14 per cent had moderate or slight abdominal distention. Certainly, the relative freedom from postoperative distention and vomiting, the absence of kidney irritation and the ease with which operative procedures are carried out under spinal anesthesia without undue traumatism to the abdominal organs are all factors contributing toward the patient's welfare.

The question of mortality which, in the final analysis is the most important consideration, must be thought of when choosing an anesthetic. Statistics on spinal anesthesia deaths are not all in accord. For instance, Nonrad in a survey of the literature on spinal anesthesia in 62,000 cases, computed the death rate as 1 in 2610. Boris Rappaport,<sup>3</sup> in a series of 1875 cases, had only 2 deaths due to spinal anesthesia. Averett,<sup>4</sup> in his series of 896 cases, reports 1 death. Falk<sup>5</sup> quotes from statistics collected from the literature by Rygh and Bisjunon 250,895 spinal anesthetics with 75 deaths, a rate of one in 3345.

In the series of 200 spinal anesthetics herein reported we had no fatality either during or following operation. However, shortly after the completion of these studies, we had a rather tragic experience. The death of this woman a few minutes after the anesthetic was introduced brought to light some very important facts concerning the use and abuse of spinal anesthesia. The history is as follows:

A patient, fifty-one years of age, was admitted to the hospital Nov. 27, 1932, with a diagnosis of ovarian tumor and possible ascites. Examination showed a markedly distended abdomen with no movable dullness. Vaginal examination showed a mass to right of uterus which was rather hard and was the size of a grapefruit. Medical examination was essentially negative. All laboratory studies were negative. Her temperature ranged between 99° and 100°. The abdominal distention was thought to be due to pressure on the bowel, since no movable dullness nor bulging of the posterior culdesac were present.

Previous to the operation the patient received three-fourths grain of ephedrin sulphate followed by 80 mg. of spinocaine between the third and fourth lumbar vertebrae. Soon after the injection of the anesthetic her blood pressure fell to zero and her pulse became imperceptible. Respiration, however, was fairly regular at first; then it became irregular and infrequent. Despite every available measure she died before an incision into the abdomen was made. Two factors contributing to this accidental death are: (1) The use of spinal anesthesia in a woman who was shown subsequently to have ascites. It is believed that large abdominal tumors or large amounts of fluid in the peritoneum produce pressure against the diaphragm when the patient is put in a Trendelenburg position. This interferes with cardiac and respiratory functions. The anesthesia itself partly paralyzes the diaphragm and the intraabdominal pressure aggravates the condition. (2) Measures to combat the sudden fall of blood pressure incident to spinal anesthesia should have been employed long before her blood pressure fell to zero.

#### CONCLUSIONS

1. In properly selected cases spinal anesthesia is as safe as inhalation anesthesia.

2. The preoperative use of ephedrin fifteen minutes before anesthesia is advocated as a prophylactic against too great a drop in blood pressure.

3. In plastic operations in the pelvis smaller amounts of anesthesia may be used.

4. Cases with systolic blood pressure above 160 or below 100 react badly to spinal anesthesia and as a general rule should not be selected for this type anesthesia.

5. We do not favor spinal anesthesia in patients having very large abdominal tumors or large quantities of fluid in the peritoneum.

6. The operating staff should be prepared for immediate steps to combat any complications.

7. The one death reported though due to spinal anesthesia should be recorded as one due to faulty judgment in selection of anesthesia.

## REFERENCES

- (1) *Volcker, E.*: Zentralbl. f. Gynäk. 53: 1626, 1932. (2) *Volcker, E.*: Zentralbl. f. Gynäk. 53: 1626, 1929. (3) *Rappaport, Boris*: New England J. M. 204: 1254, 1931. (4) *Averett, L., Sussman, W., and Zimring, D.*: AM. J. OBST. & GYNEC. 24: 339, 1924. (5) *Falk, H. C.*: Am. J. Surg. 11: 461, 1931.

## DISCUSSION

DR. BERNARD MANN.—Since September, 1930, at the Mount Sinai Hospital, there were three deaths in 7000 cases from ether and nitrous oxygen anesthesia. During this time there occurred three deaths from spinal anesthesia in 727 cases and two deaths from avertin anesthesia out of 18 cases.

The three deaths from spinal anesthesia were due to disregarding the contraindications for this type of anesthesia. One was a large abdominal tumor in a very obese woman. The second was a large scrotal hernia, and the third was a cesarean section.

While I have done cesarean sections under spinal anesthesia without a fatality, I would not use it again. Pregnancy is one of the contraindications.

There seems to be no unanimity of opinions on this subject. Some surgeons laud its use, while equally capable ones condemn its use. One surgeon will always use adrenalin with the spinal anesthesia, while another never uses the drug.

I have asked many physicians this question: Would you take spinal anesthesia if you had to be operated upon? The answer was usually no.

## CERVICAL CAUTERIZATION UNDER PARAMETRIAL ANESTHESIA\*

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MANY writers emphasize the value of cauterization in the treatment of cervicitis, and as a prophylactic measure against carcinoma. The purpose of this contribution is to describe a technic, universally applicable, which renders possible a more extended use of this method.

While much has been contributed, in recent years, to our fundamental knowledge of the pathologic processes in cervicitis, there is, as yet, no satisfactory standard nomenclature. For example, "ectropion," which is the term most frequently employed to designate the common lesion of cervicitis, appears confusing, since, like "eversion," it implies traumatic and mechanical factors rather than a histopathologic process. It is suggested that a more descriptive term, "ectrophion" (out growing) be adopted in place of "ectropion" (out turning). Also, it appears reasonable to select a companion term for "epi-

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dermidalization," replacement of columnar by squamous epithelium, for example, and "columnarization," replacement of squamous by columnar epithelium.

Correlation of clinical and pathologic findings is best realized by preliminary biopsy, which has become routine in the technic about to be described. It is apparent that cauterization favors physiologic repair by fibrosis and epidermidalization.

Patients are selected according to the usual criteria to eliminate pregnancy and recent pelvic inflammation. They are instructed in regard to proper bowel elimination, douche on the morning of operation, and report one week after the cessation of the last menstrual flow.

### TECHNIC

As a rule, no preliminary narcosis is employed, because the patients are ambulant and must be able to return to their homes unattended, soon after treatment. Otherwise, a barbitol derivative is indicated, both as a sedative and as a prophylactic measure against possible novocaine toxicity.

To avoid an unnecessarily detailed description of the technic, only certain salient features will be discussed. Excellent exposure is secured by first inserting the lateral blades of a Levy self-retaining vaginal speculum, employing them in the inverted position, the handles toward the pubis. They are then opened sufficiently to admit an ordinary bivalve speculum within the lateral blades. Thus an ideal four-bladed retractor, easily adjustable, maintains adequate exposure without assistance, and protects the vaginal walls from accidental burning, and, to a certain extent, from excessive heat radiation.

Alcohol is used for intravaginal preparation. A light, fine-toothed tenaculum grasps the cervix superficially, thus avoiding considerable discomfort. Parametrial anesthesia, as advocated by Gellhorn for surgery of this area, is used routinely in cauterization. A special extension for a Luer syringe, five inches long, one end of which is fitted with a B.D. safety lock, attaches securely to a flexible, short beveled, safety beaded anesthesia needle, two inches long from bead to bevel. The flexible needle does not break readily, and, in the event of such an accident, the safety bead would enable the operator to retrieve it quickly. The short bevel helps to avoid puncture of blood vessels. The locking device on the extension saves the annoyance and delay of needles becoming disengaged. If desired, the syringe may lock with the extension, also.

Freshly prepared novocaine solution, one-half per cent, with adrenalin, minimis three per ounce, is employed. Ten cubic centimeters are injected into each lateral fornix, into the reflected fold of mucous membrane revealed by drawing the cervix toward the opposite side. The point where the portio and vagina meet is the landmark for the parametrial injection. The needle is first inserted superficially to form a wheal as in skin infiltration, and a small amount of the anesthetic solution injected ahead of the needle until it penetrates the parametrial tissue to a depth of one to one and one-half inches. The needle hugs the lateral wall of the cervix but does not penetrate it, as noted by the absence of marked resistance to the passage of the solution. It is extremely important to aspirate frequently to avoid penetrating a blood vessel, and to inject slowly at all times. Five cubic centimeters of the anesthetic solution are injected superficially between the cervix and bladder, and between the cervix and rectum. Anesthesia is complete in five minutes.

The biopsy section is now removed and the area cauterized by charring and puncture to control all bleeding. The canal, which is usually easily patulous, is next treated by linear cauterization with the flexible tip of the Post cautery, burning four to six grooves. Areas of "ectrophion" are completely covered by radial lines or multiple punctures. Cysts are evacuated and sterilized by puncture. Hypertrophy is reduced by deep puncture into the muscle. The treatment by cauterization should not be performed casually but thoroughly to achieve results. Packing is rarely needed.

The whole procedure requires very little time, and the patient can leave after a rest of fifteen minutes. She is instructed to lie down for the balance of the day and to use saline douches after the third day as required for cleanliness. She is warned of an increased discharge and the possibility of bleeding.

The patient is seen at weekly intervals, when the area is cleaned, the canal dilated if necessary, and mercurochrome applied topically. Douches are continued as long as the discharge is present. When epidermidalization is complete, the discharge checked, and the canal patulous, the patient is discharged, with instructions to return if symptoms recur.

#### ANALYSIS OF ONE HUNDRED CASES

These cases were cauterized and studied in the Out-Patient Departments of the North End Clinic, the Deaconess and Woman's Hospitals, Detroit, from July 1, 1931, to July 1, 1932. All but two, which were cauterized before operation, were ambulant. Approximately 75 per cent of these were cauterized under parametrial anesthesia and the advantages to patient and operator were readily appreciated by comparison with the control group. All cases of extensive involvement received anesthesia.

The following data are submitted:

AGE INCIDENCE						
Under 20	20-30	30-40	40-50	Over 50	White	82
3	46	33	17	1	Colored	18
PREGNANCY						
None	Abortion or Miscarriage, Only	P. i	P. ii	P. iii	Over iii	Abortion or Miscarriage, Also
11	4	39	21	11	14	11
ANESTHESIA						
None	Parametrial	General	Biopsies	Previous Cauterization	Repeat Cauterization	
24	74	2	40	3	4	
REACTIONS						
Novocaine		Hemorrhage		Exacerbation		
0		1		0		
SYMPTOMS						
Leucorrhea	Lower Abdominal Pain	Backache	Menorrhagia or Metrorrhagia	Dysmenorrhagia		
92	59	45	24	12		

Dyspareunia 4	Sterility 7	Constipation 46	Headache 11	Urologic Symptoms 20	
<hr/>					
CERVICAL PATHOLOGY					
Laceration 39	Hypertrophy 31	Ectrophion 87	Cysts 17	Discharge 96	Bleeding 5
<hr/>					
ASSOCIATED GYNECOLOGIC PATHOLOGY					
Pelvic Inflam- mation 29	Retroversion 21	Pelvic Floor Injuries 29	Trichomonas 8	Descensus 2	
<hr/>					
DURATION OF SYMPTOMS					
Postnatal Cases 15	Symptoms Less Than One Year 61		Symptoms Over One Year 39		
<hr/>					
RESULTS					
Definite Improvement					
Anatomic and Symptomatic 92	Anatomic Only 1	Symptomatic Only 1	Partial Im- provement 6	No Improve- ment 0	Pregnancy 6
<hr/>					
COMMENT					

*Biopsies all showed chronic inflammatory changes; two were typically precancerous; none in this series proved malignant.*

This study was undertaken during an economic crisis which indicated a resort to palliative measures in patients ordinarily treated surgically.

By the use of parametrial anesthesia, this procedure can be performed as thoroughly, and almost as painlessly, as under general anesthesia. The patient remains ambulant and seldom requires more than one treatment. If further treatment is required, the patient does not dread an approaching ordeal. Biopsy is conveniently performed at this time. Few cases will show a better end-result with surgery.

Two terms are suggested in the nomenclature of cervical pathology: "ectrophion" in place of "ectropion"; and "columnarization" as a companion term to "epidermidalization."

The author acknowledges with sincere appreciation the cooperation of Dr. James E. Davis, Director of Pathology Department, Detroit College of Medicine & Surgery, who interpreted the pathology of the biopsies, and who, by his kindly interest and many suggestions, aided in this work. He wishes to express his appreciation, also, of the friendly criticism and guidance of his preceptor, Dr. C. Hollister Judd, Chief Attending Gynecologist, Woman's Hospital, Detroit.

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## DÜHRSSSEN'S INCISIONS OF THE CERVIX\*

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IT IS with a little fear that I venture to discuss, much less advocate, a procedure more or less condemned by most writers. However, I feel that such discussion is timely, for more and more is cesarean section being resorted to in the type of obstetric problem I shall discuss.

Every obstetrician will occasionally be confronted with the problem of long labor and an undilated cervix. His patient may be in labor several days, the membranes ruptured, the pulse rate rising, and slight fever present. The head is engaged but the cervix not yet fully dilated and no advance in dilatation occurring in spite of all measures used to further it. Termination of labor is demanded. How is this to be carried out? Some would risk the danger of cesarean section; others might attempt manual dilatation, or, as they put it, "to push the cervix back over the head." Others might do an anterior vaginal hysterotomy and still others might yet choose to wait. At the Jewish Hospital we prefer to make bilateral Dührssen's incisions in the cervix and then deliver the patient per vaginam.

Incisions of the cervix in labor are usually named after Dührssen because it was he who first attempted to popularize the operation in a paper published in 1890. However, DeLee states that Baudelocque condemned the procedure one hundred years previously and that Skutsch and Godemer also antedated Dührssen.

There is very little in the modern literature on the subject. Williams speaks of the danger of deep lacerations occurring which may give rise to profuse hemorrhage. DeLee also speaks of the danger of hemorrhage if the operation is performed before complete effacement of the cervix. The few papers that have been written within the last twenty-five years are mostly in the French literature. The French generally prefer to make anterior and posterior incisions rather than lateral. They speak of the greater danger of hemorrhage with lateral incisions. However, they state that with anterior and posterior incisions there is danger of extension taking place into the bladder and rectum. Most of the French writers do not repair the cervix. Especially with the anterior and posterior incisions they say it is surprising to see how well the edges come together if not sutured. Some of the French writers also add as a complication the possibility of the scarred cervix interfering with future labor. Recently, Danforth, in a paper on occiput posterior, mentioned the occasional necessity for Dührssen's incisions. Otherwise the American literature scarcely mentions the subject.

At the Jewish Hospital we have found it expedient occasionally to make bilateral incisions of the cervix to allow operative delivery.

\*Read before the Brooklyn Gynecological Society, April 7, 1933.

Between the years 1915 to 1931 inclusive, there were at the Jewish Hospital, 23,234 deliveries. During this same period of time there were 143 cases of Dührssen's incisions, an incidence of 1 in 161.

Dührssen's incisions are indicated if the cervix, which is  $3\frac{1}{2}$  fingers or more dilated, does not dilate further after another eight to ten hours of satisfactory labor and the mother is showing signs of exhaustion, assuming, of course, that the presenting part is engaged. The usual picture of the case in which Dührssen's incisions are made is a patient who is generally a primipara, in labor over twenty-four hours, and often two or three days, the head engaged, membranes ruptured, the cervix effaced and having reached a dilatation of three or more fingers. Advance is at a standstill notwithstanding morphine, stimulation and abdominal binder. These mothers are usually exhausted and sometimes show elevation of temperature. The fetus often is showing beginning signs of distress. In short, it is a picture of a patient who has done all she can, and we consider that further delay is foolhardy. In the great majority of cases the patient will fall into such a category, but to be more specific, I have tried to classify the indications. The classification is very inaccurate for many of the indications were multiple and many overlapped.

Fetal distress	23
Prolapsed cord	2
Primary inertia	4
Eclampsia	4
Impending eclampsia	3
Cardiac	3
Maternal distress	5
Edema of cervix	2
Cervix about aftercoming head	2
Bandl's contraction ring	2
Cervical dystocia	93

*Fetal Distress.*—I think there can be little argument about the cases in which the Dührssen's incisions were made because of fetal distress. These were almost all cases in which the labor had been long and the membranes ruptured prematurely. The average duration of labor in these cases was 38.4 hours. The average time elapsed between rupture of the membranes and delivery was twenty-five hours. The average time elapsed without increase in dilatation was nine hours, although in some cases it was over twenty-four. In almost all these cases the cervix was between  $3\frac{1}{2}$  and  $4\frac{1}{2}$  fingers dilated. There were two stillbirths in this group. In one case the mother had influenza while in labor and this may have contributed to the fetal death. In the other case delivery was complicated by a Bandl's contraction ring.

*Prolapsed Cord.*—The two cases in which Dührssen's incisions were done because of prolapsed cord happened many years ago. The first

case was admitted in 1916, four fingers dilated, the pulsating cord presenting. Attempts at manual dilatation were unsuccessful. The left side of the cervix was incised and version and extraction performed. The fetus was stillborn. It was found after delivery that the side of the cervix which had not been incised had torn up beyond the vault of the vagina. The cervix was repaired. There was moderate bleeding and the vagina was packed. The mother had an uneventful puerperium.

The other case of prolapsed cord occurred in 1917. The mother had a double mitral lesion. Labor was induced by bag. Following expulsion of the bag the cord prolapsed. The cervix which was 3 fingers dilated, was incised and high forceps applied. A normal baby was delivered which died on the eighth day of hemorrhagic disease of the newborn.

*Primary Inertia.*—There were four cases in which primary inertia was the cause of incomplete dilatation. However, there were also other factors which finally rendered interference warranted. The average duration of labor in these cases was sixty hours, the average length of time without progress in dilatation, nine hours. In one case a Bandl's contraction ring was the immediate cause for interference, in another, maternal exhaustion. In a third, the patient had developed acidosis and following improvement after glucose therapy and pantopon, interference was decided upon. Two of the babies were stillborn. One was dead two hours before interference, after the mother had been in labor seventy-four hours.

*Eclampsia.*—In four cases, eclampsia was the indication given for the Dührssen's incisions. Two of these occurred in 1917, one in 1924, and one in 1929. The two patients treated in 1917, had they occurred today, would be handled otherwise.

The first was a gravida i, seven months pregnant. There were two convulsions, following which the cervix was incised and a premature baby delivered by version and extraction. There was no maternal morbidity.

The second patient, occurring in 1917, was eight months pregnant, parity unknown, admitted moribund with edema of the lungs, cardiac dilatation, and having convulsions. The cervix was incised and a stillborn fetus delivered by version and extraction. The mother died one and one-half hours after admission to the hospital.

The next case was a gravida i, who had been bagged because of preeclamptic toxemia. After thirty-four hours of labor the cervix was 4 fingers dilated. At this time the patient had 6 convulsions. The cervix was incised and a normal fetus delivered by high forceps. There was no morbidity in this case.

The last case was a gravida i. While in labor she had one convulsion. Rectal examination led the obstetrician to believe that the cervix was fully dilated. Under spinal anesthesia, however, it was found that the cervix was only  $3\frac{1}{2}$  fingers dilated. Bilateral incisions were made in the cervix and a normal baby delivered by low forceps. The placenta showed a large, fresh area of separation and we feel that this baby would have been lost if it had not been delivered promptly. The mother had no morbidity.

Our treatment of eclampsia today is more conservative and the first three cases had they occurred today would have been handled otherwise. We also do not condone high forceps today.

*Impending Eclampsia.*—There were three cases in which the indication was impending eclampsia.

In one patient labor had been induced by cervical packing and later bag insertion. After twenty-six hours of labor the cervix was 3 fingers dilated. Dilatation was not advancing and meconium was present. Dührssen's incisions were followed by mid-forceps delivery of a stillborn fetus.

Another case had been in labor 30 hours, a rim of cervix remaining for 6 hours. Incision of the cervix was followed by midforceps delivery of a live baby.

The third patient had been in labor twenty-four hours, the mother's pulse rising to 140. A live baby was delivered by midforceps after incising the cervix.

None of these mothers showed any morbidity and none of them had convulsions.

*Cardiac Disease.*—There were three cases in which the ultimate indication was cardiac disease. After these patients had been in labor twenty-one, forty, and fifty-nine hours respectively, the head in midpelvis, in each case, and progress at a standstill, it was felt wise not to tax the heart with more labor. The babies were all normal. One mother had a two day morbidity, the temperature reaching 101°.

*Maternal Exhaustion.*—This was the indication in five cases. However, there were many other cases in which exhaustion was present but was not the sole indication. In fact, a majority of the patients under discussion showed some evidence of exhaustion. Our usual criterion is a rising pulse rate. However, some also show elevation of temperature, and evidence of acidosis and dehydration, in spite of measures taken to prevent them. Since these cases were handled we are more apt to treat the acidosis and dehydration, rather than interfere with the labor. The patients in this group had been in labor on an average, 68.6 hours.

*Edema of Cervix.*—In two cases this was the primary indication for interference. Although quite common in this series, in only two was the edema itself sufficient to warrant interference. One of the two babies died on the third day. Autopsy showed left lobar pneumonia and pericarditis.

*Cervix Around Aftercoming Head.*—In two such cases the cervix was incised, one a transverse presentation with prolapsed arm in which version and extraction had been done with a rim of cervix remaining. The other was a footling presentation with spontaneous delivery down to the head.

*Bandl's Contraction Ring.*—The terms contraction ring and Bandl's retraction ring are used so interchangeably in the literature that I have made no effort here to distinguish them. In two cases, both patients had been in labor a long time. Both babies were stillborn.

In each case the contraction ring made delivery extremely difficult. One of these patients had been in labor ninety hours before being sent to the hospital. An attempt had been made to deliver her by forceps at home, although the cervix was still less than 4 fingers dilated. Her temperature was 104°, pulse 160, the head unengaged. She was given morphine and later when her condition permitted, the cervix was incised and the baby, which was dead, delivered by craniotomy and bilateral cleidotomy. She had a ten-day morbidity.

There were numerous other cases in this series with contraction and retraction rings, but these were not discovered until attempt at delivery. We have learned to fear this complication. It has made delivery extremely difficult. We met with this complication particularly in cases in which we had waited unusually long for the cervix to dilate, but without success. Given a patient in whom the cervix remains 3 or 4 fingers dilated for hours without a change, a contraction ring is to be looked for, usually between the baby's head and shoulders. We feel that we could have avoided several stillbirths if we had interfered before this complication arose.

*Cervical Dystocia.*—The balance of the cases under discussion, i.e. 93, have been classified under this heading. It is unsatisfactory and inaccurate and is used merely because of the difficulty of classifying these cases. Some were undoubtedly instances of true cervical dystocia. These were cases in which the position of the occiput was anterior, the head flexed and engaged and the mother having good pains. We could explain the difficulty in dilatation only by assuming that the cervix was at fault. Many of the cases in this group, however, were occiput posteriors with the membranes ruptured and the head poorly flexed. Some should probably have been classified as primary inertia. Others started off with good labor but developed secondary inertia. All of these patients had long labor. Some of them developed Bandl's contraction rings which interfered greatly with delivery. The results obtained in this group are considered with the series as a whole.

#### PROCEDURE

The perineum was always incised before the Dührssen's incisions. We make two lateral incisions in the cervix, corresponding to 3 and 9 o'clock on a watch dial. It would seem that this is a particularly dangerous point at which to incise the cervix because of the proximity to the uterine vessels, but our results seem to prove that it is as safe to incise at this point as at any other. On several occasions we have made three incisions in the cervix but have given this up because it offers no advantage. In making the incisions the fingers are inserted into the vagina, one passing inside the cervix, another outside. A



long handled scissors is inserted and the blades guided, one along each finger, and with one cut the cervix is incised up to the vault. Delivery is now carried out. In most cases the cervix and perineum are repaired immediately after the birth of the placenta. Occasionally the repair is deferred several days.

Of the entire series of 143 patients all but 17 were having their first baby.

The average duration of labor for the entire series was forty-nine hours. If one were to allow here for the cases in which interference was carried out early because of some such indication as fetal distress, prolapsed cord, eclampsia, etc., the average duration of labor for the balance of the series would be much greater than forty-nine hours. Except for such emergencies, the patients on whom we carried out this operation had had a long, difficult labor, usually lasting about three days.

The average length of time the membranes had been ruptured was 38.1 hours.

The cervical canal should be obliterated and the os at least  $3\frac{1}{2}$  fingers dilated. The cervix in almost all our cases was  $3\frac{1}{2}$  to  $4\frac{1}{2}$  fingers dilated. The average length of time without advance in dilatation was 10.3 hours. This figure would be much higher if we were to allow for the cases in which the procedure was carried out because of such emergencies as indicated above. In most cases the cervix was thin. In many, however, it was edematous.

At the time of interference, 26 cases were occiput anterior. With the exception of 2 brow, 1 face, and 3 breech presentations, the remainder were either occiput transverse or posterior. In many cases deflexion was noted.

In this series there were 5 low forceps deliveries, 107 midforceps, 15 high forceps, 3 breech extractions, 10 versions followed by extraction, 9 craniotomies, 3 bilateral cleidotomies, 1 evisceration, and 8 cases of manual removal of the placenta. Two patients were allowed to deliver spontaneously after incision of the cervix. All the craniotomies were on dead babies. We rarely do a high forceps delivery today.

In 16 cases only one side of the cervix was incised. The cervix in these cases was so nearly fully dilated that the obstetrician felt that if one side were incised the other side would offer no difficulty. However, it was almost invariably found after delivery that the opposite side had been lacerated. At least nine of these required repair of the uncut side. In fact, in two cases the laceration of the side not cut extended beyond the vault of the vagina. It appears evident that if incision of the cervix is justifiable at all, both sides should be incised.

In this series of 143 cases, 123 babies were born alive and 20 were stillborn, a fetal mortality of 13.9 per cent. Six of the stillborns were

dead before interference, 8 died of cerebral hemorrhage, 2 of congenital defects. In 2 cases Bandl's contraction rings interfered sufficiently with the delivery to cause the babies to be lost. In 1 case there was a prolapsed cord. In another, the mother had influenza while in labor and this probably contributed to the death of the fetus.

## STILLBIRTHS

Died before interference	6
Cerebral hemorrhage	8
Congenital defects	2
Bandl's contraction ring	2
Prolapsed cord	1
Influenza (mother)	1

Of the 123 babies born alive 7 died, a neonatal mortality rate of 5.7 per cent. Two died of cerebral hemorrhage, 2 of congenital defects, 1 of hemorrhagic disease of the newborn, 1 of lobar pneumonia, and pericarditis and the last of prematurity.

Cerebral hemorrhage	2
Congenital defect	2
Hemorrhagic disease of the newborn	1
Lobar pneumonia and pericarditis	1
Prematurity	1

This leaves 116 live babies out of 143. These figures mean that 18.9 per cent of the babies were lost. If one allows for the babies that would have been lost regardless of the method of procedure, i.e., babies which were dead before interference, babies with congenital defect, pneumonia, prolapsed cord, etc., the total fetal mortality was 6.9 per cent. If one remembers that we are discussing here a series of difficult obstetric problems, this fetal mortality does not appear high.

The one maternal death in this series occurred in 1917. The patient was admitted in a moribund condition with a history of convulsions. There was edema of the lungs. The parity is unknown. The cervix was incised, version and extraction performed and a stillborn eight months' fetus delivered. The mother died one and one-half hours after admission. Although the conduct of this case can be criticized, this patient would probably also have died with our modern conservative treatment.

We have followed the usual standard of morbidity, i.e., 100.4° on two successive days or 101° on any one day. Following this standard, 54 mothers had "morbidity." Four of these had fever ranging from 100.5° to 103°, with chills, before interference. One had pyelitis, another had influenza. The uncorrected morbidity rate was 37.7 per cent.

The average stay in the hospital was 15.8 days for the entire series and 18.2 days for the morbidity cases. This includes the time spent in the hospital before delivery. One must remember in this connection

that the average duration of labor for the series was forty-nine hours and this served to lengthen the stay in the hospital beyond the usual by about one day.

The danger of serious hemorrhage immediately comes to one's mind when one speaks of Dührssen's incisions. In the entire series of 143 cases there were 11 patients in whom the amount of bleeding was recorded as abnormal. It has not been our custom to measure the amount of blood lost, but one can estimate the degree of severity of hemorrhage from the fact that in only 3 cases was it necessary to pack the uterus and in 3 others the vagina. In no case was it necessary to give the patient a blood transfusion because of hemorrhage. The hemorrhage in these patients came from the uterus and not from the cervix. When the uterus was made to contract, or when the placenta was removed manually, as was done in 7 cases, the bleeding was con-

TABLE I

6 WEEKS POSTPARTUM			6 OR MORE MONTHS POSTPARTUM		
Cervix	Good	57	{	Good	30
	Fair	6		Fair	2
	Poor	6		Poor	4
Anterior wall	Good	58	{	Good	30
	Fair	6		Fair	3
	Poor	6		Poor	3
Posterior wall	Good	65	{	Good	34
	Fair	2		Fair	1
	Poor	3		Poor	1

trolled. The fact that the bleeding came from the uterus, rather than from the cervix, is further borne out by the fact that in nine of these eleven bleeding cases the cervix was not repaired at the time of delivery and still the hemorrhage was controlled. The abnormal bleeding we had in this series was the hemorrhage one so often gets after long labor and prolonged anesthesia. In our experience, Dührssen's incisions did not increase the incidence of postpartum hemorrhage.

We were able to trace the results of 29 pregnancies in these women subsequent to incision of the cervix. Eighteen of these pregnancies terminated in easy, spontaneous deliveries, the average duration of labor being 10.2 hours. In 4 cases the delivery was by low forceps, in 2 cases by midforceps. In 2 cases cesarean section was performed because of disproportion. One resulted in a seven months premature and two ended by spontaneous abortion. In only one case did the cervix offer any difficulty at the subsequent delivery. In this case the cervix was incised again, but the obstetrician later felt that morphine could probably have taken the place of incision. In none of these cases was there any postpartum hemorrhage.

We were able to find 2 cases that have been sterile since the first delivery.

A follow-up study to determine the condition of the soft parts was made by sending questionnaires to the obstetricians whose cases were being studied. The results are shown in Table I.

These figures represent replies received from 22 obstetricians. Two cases were reported that had subsequent amputation of the cervix. Uterine prolapse has apparently not been conspicuous, for no cases were reported.

#### DISCUSSION

I do not wish to be understood as advocating frequent Dührssen's incisions of the cervix. Quite the contrary. I look upon it as a major procedure to be resorted to but rarely. Nevertheless, I believe that there is a definite field for its occasional use. Given a case such as I have described, in which labor has come to an impasse and the head is engaged, Dührssen's incisions offer a way out of the difficulty. Cesarean section in such cases carries with it considerable danger even if the operation is of the newer, low type. Manual dilatation is not dilatation at all. "To push the cervix back over the head," as some claim they do, is merely to lacerate the cervix rather than incise it. Anterior vaginal hysterotomy is a major operation and appears so formidable compared with Dührssen's incisions, which accomplish as much. The only other course open is to wait. We have waited. We have given patients 5 and 6 doses of morphine, fed them carbohydrates and fluids, and waited, and still some of them would make no progress in dilatation. We have had patients in whom dilatation did not advance in twenty-four hours. Some of these patients developed Bandl's contraction rings which made delivery extremely difficult. Sometimes, while waiting, the fetal heart would disappear. Often the mother would develop acidosis in spite of our efforts to prevent it. In short, we feel that conservative waiting beyond a certain point is no longer a virtue.

In considering our maternal results, it should be borne in mind that we were not dealing with good risks. The patient who died was moribund when admitted. She probably would have died whatever was done, or not done. The maternal morbidity although 37.7 per cent is uncorrected. A better idea of the maternal results is gained by considering the fact that the average stay in the hospital was 15.8 days in spite of the fact that labor usually lasted over two days.

Although 27 of 143 babies were lost, this includes 6 babies which were dead before interference and other babies whose deaths could not be rightfully attributed to the delivery per se.

## REPORT OF TWO CASES OF GRANULOSA CELL TUMORS OF THE OVARY\*

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THE term "granulosa cell tumor" of the ovary designates a relatively benign neoplasm, whose constituent elements morphologically simulate follicular lining epithelium. Retaining the physiologic function of their normal prototypes, the tumor cells induce uterine and mammary hyperplasia. Studies by Meyer and Habbe on thirty-three specimens seemingly indicate origin of this tumor group from Walthard cell clusters in the hilum or medulla of the adult ovary.

Clinically, granulosa cell tumors generally occur after puberty. A recent analysis of 80 cases collected by E. Klasten, shows age distribution as follows: Seven cases appeared before puberty and two simultaneously with the onset of menses. Thirty-nine cases (48.7 per cent) appeared during active sex life and 34 (42.5 per cent) after the menopause.

The prognosis in granulosa cell tumors is, as a rule, quite favorable. Simple surgical removal is followed by prompt cessation of bleeding and rapid involution of the uterus and breasts. In Klasten's analysis of 80 cases, 6 or 7.5 per cent were described as inoperable when first seen. Of the remaining 74 surgically treated, only 4 recurrences were noted. The others were cured. Granulosa cell tumors involute favorably after x-ray and radium treatment.

In the past nine years two specimens of granulosa cell tumors were received in the Gynecological Laboratory of the Long Island College of Medicine and are reported as follows:

CASE 1.—Mrs. G. M., aged twenty-seven, was admitted to the Gynecological Ward Sept. 10, 1932, complaining of enlargement of the abdomen and vaginal bleeding. The medical and surgical history was essentially negative. Menstruation began at the age of twelve, recurred every thirty days and lasted for five or six days. At the age of thirteen, the patient was kicked in the abdomen and for the ensuing six weeks bled constantly. The flow ceased spontaneously, but menstruation became exceedingly infrequent until the age of twenty-six, when as result of medication, regular menstruation was reestablished in May, 1931. The periods then recurred regularly every twenty-eight days and lasted for five days. The patient had been married for four years but had never been pregnant. The present illness dated from June 11, 1932. At the time of expected menstruation, vaginal bleeding appeared and had continued without interruption until admission. In addition, enlargement of the abdomen had been noticed for the past three weeks. Physical examination of the head, neck, and thorax were essentially negative. The abdomen was distended by a tumor mass roughly the size of a seven months' pregnancy. The lower pole evidently originated in the pelvis. The tumor was tense and lobulated. There was greater fullness on the right side. Vaginal examination showed a nulliparous introitus. There was moderate vaginal bleeding. Cervix was found intact.

\*Read at a meeting of the Brooklyn Gynecological Society, April 7, 1933.

The body of the uterus could not be definitely defined due to abdominal distention. The lower pole of the tumor was felt high in the right fornix. Laboratory data were as follows: Blood pressure was 134/98. Urine and blood count showed no departure from the normal. On Sept. 13, 1932, under ether anesthesia the abdomen



Fig. 1.—Case 1. Gross section of a cystic form of granulosa cell tumor. Multiple cystic locules surround a semisolid zone. The lining epithelium of the cystic cavities is smooth, grayish white. The semisolid area is yellow and spongy.

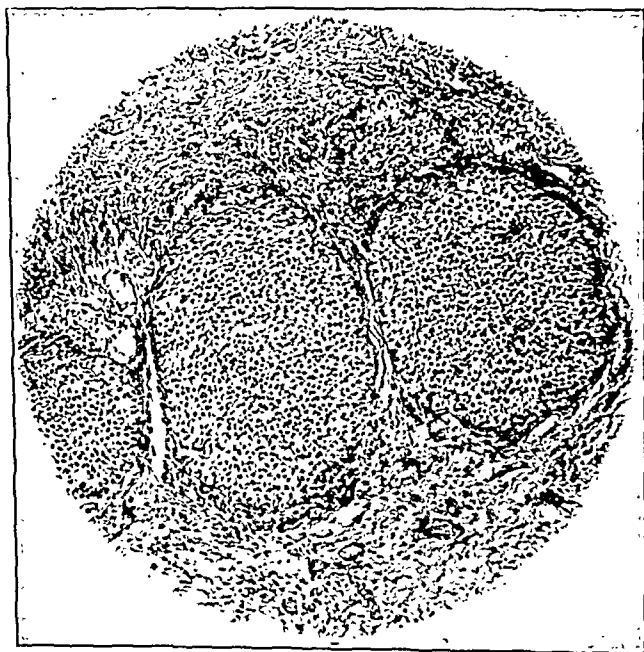


Fig. 2.— $\times 100$ . Case 1. Section through the wall of a cystic locule. A band of fibrous tissue lines the cavity. It supports alveoli of granulosa cells. Note the sharp cell outline, clear cytoplasm and vesicular nucleus.

was opened and right salpingo-oophorectomy performed. Postoperative course was uneventful. To date, six months after operation the patient is symptom free.

#### DESCRIPTION OF SPECIMEN

The excised specimen consisted of right tube and ovary. The tube was symmetrical in form and contour and measured 10 cm. in length, 5 mm. transversely at the uterine end and 8 mm. at the outer ampullar segment. Ostium and fimbriae were normal. On multiple section, mucosa, muscle and serous coat were free from changes. Microscopic examination showed moderate congestion of all coats.

The ovary had been converted into a huge ovoid cyst measuring 28 cm. in diameter. Externally the wall was lobulated, grayish white in color except for focal areas of hemorrhage. On section serosanguineous fluid was evacuated. The tumor was multilocular (Fig. 1). The largest cavity, measuring 18 cm. in diameter, occupied the bulk of the neoplasm. Three remaining cystic locules, ranged from 3 to



Fig. 3.— $\times 80$ . Case 1. Section through the semisolid portion of the tumor. The pattern of the maturing follicle is often reproduced. The central cavity contains secretion. The granulosa cells are demarcated from the cavity by a narrow zone of connective tissue. The vascular stroma mimics the theca externa.

8 cm. in diameter all presenting a smooth yellowish gray lining, about  $\frac{1}{4}$  mm. in thickness. The largest showed a zone of lipidlike material 3 mm. in thickness lying subjacent to the cavity. Similar deposits were focally distributed in the walls of the smaller locules. In the hilum of the organ, and surrounded by the locules previously described, was a spongy, friable yellow brown area measuring 9 by 6 cm. At this point the tunica of the ovary was markedly thickened, measuring 18 mm. in diameter, and containing a moderate number of microcysts varying from 3 to 12 mm. in size. Of these, some were simple follicular cysts; others were surrounded by yellow lamina as noted in the larger cystic spaces.

Microscopically, multiple sections from the various cystic locules presented essentially similar changes (Fig. 2). The inner aspect of the cysts was clothed by a broad band of vascular connective tissue, focally mucoid in character due to extensive edema. More deeply the wall of the locule contained tumor cell collections sharply defined by thin strands of connective tissue. They were irregularly dis-

tributed. Through some areas they formed broad solid convoluted columns, in others only isolated alveoli. Over large stretches they were entirely lacking. The constituent tumor cell was small, round, or polyhedral in form. Cytoplasm was scant, faintly staining and the cell membrane poorly defined. The nucleus, round, oval, or occasionally spindle-shaped, was vesicular, containing a finely granular chromatin network. Where hydropic changes had appeared large clear spaces were encountered. Nutrition was generously afforded by large numbers of congested capillaries. External to the tumor alveoli the residual tunica and cortex showed marked edema. An occasional corpus fibrosis was encountered with peculiar hypertrophy of the residual theca interna cells. Through the semisolid area grossly noted in the hilum, the tumor showed reproduction of follicular, and alveolar patterns. The follicular form predominated and a replica of maturing graffian follicle was established (Fig. 3). The cysts were so numerous that the walls of contiguous cavities were separated only by narrow connective tissue septa. The central cavities, round, oval,

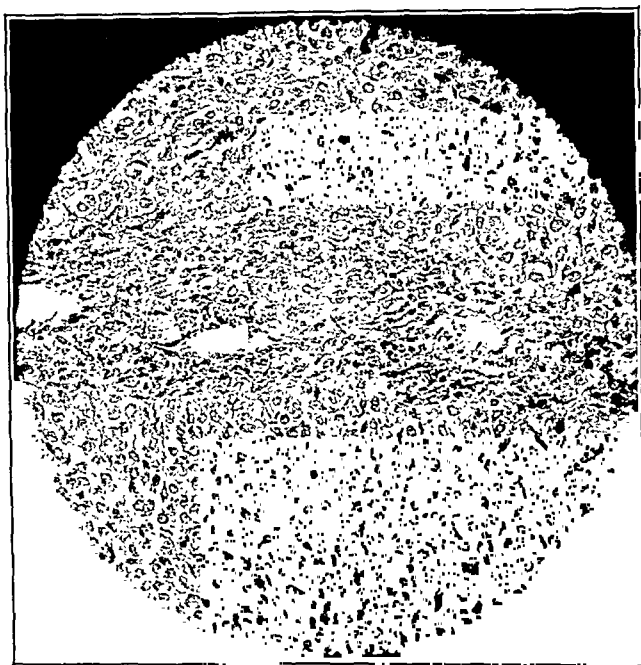


Fig. 4.— $\times 200$ . Case 1. The characteristics of the granulosa cells are well reproduced. The cells are round or ovoid with clear staining cytoplasm. The nucleus is round and oval, vesicular in character.

or elongated in form frequently contained serum and red blood cells. The smaller follicular spaces were surrounded by a narrow zone of granulosa-like cells varying from four to eight layers. The larger spaces presented ten to fifteen cell layers but this was frequently only segmental. In the largest forms, too, a narrow zone of connective tissue separated the tumor cells from the central cavity. The ovum of course was lacking. The constituent granulosa cells were round or oval in form, the cell membranes were frequently reproduced. Nuclei were round or oval and vesicular in character. Occasionally larger and more lightly stained cells appeared at the base of the column and theca interna formation was suggested. Between contiguous follicular structures an alveolar pattern was frequently reproduced, probably due to obliteration of the central cavity by proliferating lining cells (Fig. 4). In these fields the cell was somewhat larger, cytoplasm more abundant and faintly staining, probably due to the deposition of lipoid in the cell body. Mitotic figures were occasionally noted. Vascularity of the tumor was everywhere pronounced.



Large capillaries followed the connective tissue septa between adjacent follicles or in the stroma, defining alveoli of tumor cells. The tunica of the ovary was preserved.

This case, therefore, presented a cystic granulosa cell tumor of unusual dimension. Histologically the follicular pattern predominated and the large cavities contained the secretion of the tumor cells. Alveolar morphology was also noted. There were no earmarks of malignancy. Typical vaginal bleeding was present. Enlargement of the abdomen was the result of accumulated secretion in the cyst locules. Six months after operation the patient is symptom free after simple surgical removal of the involved ovary.

CASE 2.—Mrs. G. P., aged forty-eight, was admitted to the Long Island College Hospital, April 10, 1927, complaining of abdominal pain. The family and past personal history was essentially negative. Menstruation began at thirteen, recurred

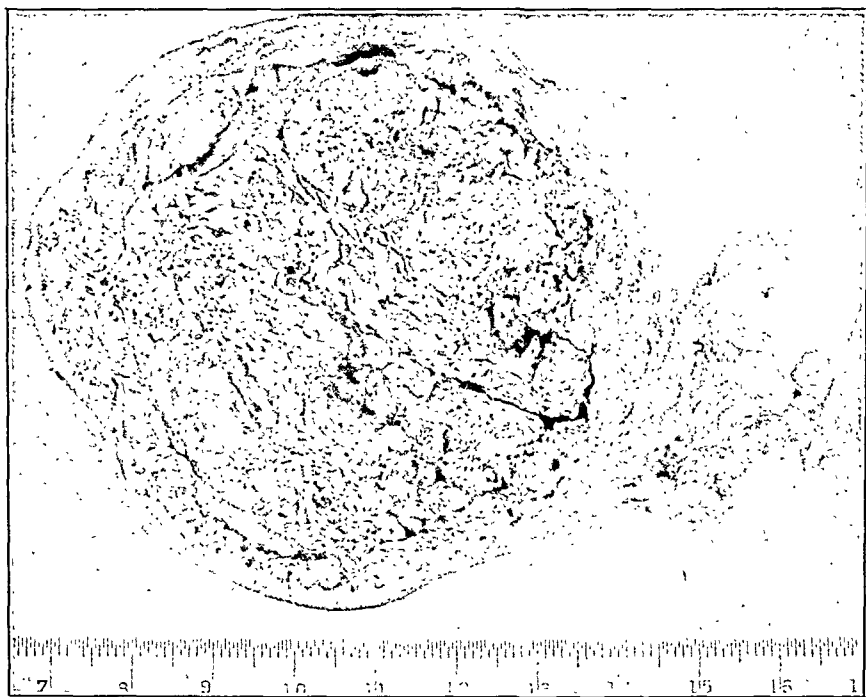


Fig. 5.—Case 2. Section of a solid type of granulosa cell tumor. Note the opaque islands of tumor tissue yellow in color on fresh section. Thrombosed veins are large, numerous and prominent.

regularly every twenty-eight days and lasted for five days. There was no change after marriage or childbirth. Menopause occurred at the age of forty-five. Patient had been married for twenty-four years; and was pregnant six times. The first five deliveries were spontaneous without puerperal complications. The sixth pregnancy terminated spontaneously at four months but was followed by severe post-partum bleeding. The present illness began June, 1926, when the patient complained of dragging and heaviness in the lower abdomen. This was evidently her only complaint until one month before admission when sharp abdominal pains also became manifest but the patient was not incapacitated. On admission, the physical examination showed the patient to be a woman of medium stature in a good state of nutrition. The head, neck, and thorax were essentially negative. The breasts were normal, parous with the usual fat atrophy of the menopause. The abdomen was wide, and lax; no masses were felt. Pelvic examination revealed a lacerated floor, with marked rectocele. The cervix was lacerated and contained nabothian cysts.

The uterus was of normal size, was displaced posteriorly by a semisolid mass about the size of a grapefruit which lay in the anterior culdesac. The laboratory data were normal. Supracervical hysterectomy, bilateral salpingo-oophorectomy and appendectomy were performed April 12, 1927. The uterus was found normal in size but displaced posteriorly by a semisolid mass in the anterior culdesac. This mass proved to be the left ovary. The right tube and ovary were normal. The appendix was distended at the tip. The postoperative course was uneventful. Follow-up examination, April 1, 1932 (five years after operation) showed the pelvis free from recurrence and the patient in excellent health.

#### DESCRIPTION OF SPECIMEN

The uterus, removed by supracervical hysterectomy, had been transected through the lower uterine segment. Form and symmetry were normal. The measurements were 6 by 6 by 4 cm. The cavity was regular; the endometrium thin and

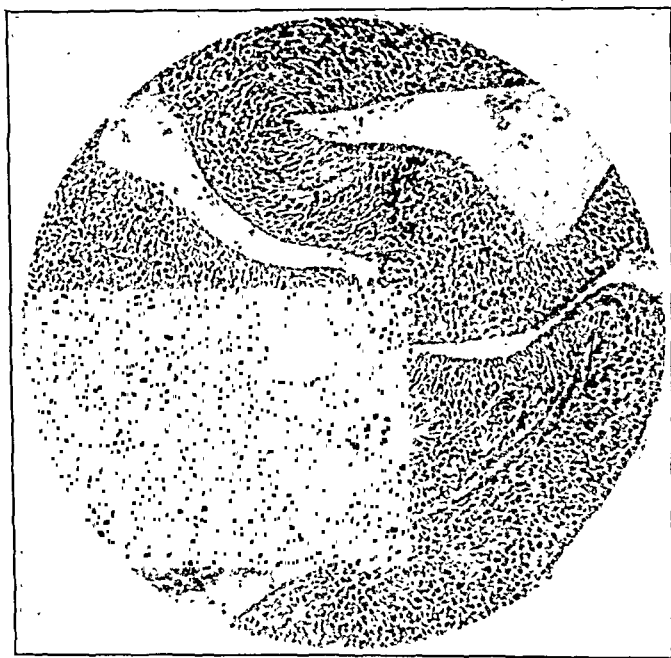


Fig. 6.— $\times 100$ . Case 2. The proliferating granulosa cell tumor reproduces a medullary pattern. The cells are compactly placed, spindle or fusiform in shape with prominent nuclei and scant cytoplasm. Note the huge size of capillary sinusoids.

smooth but injected. The myometrium measured 22 mm. in thickness. The inner fibers were hypertrophic. The vessels in the vascular zone were sclerotic. The serous coat was normal. Microscopically the endometrium was thin. The lining epithelial layer was not shown. The glands were reduced in number but relatively large sized for a senile endometrium although cystic glands were not encountered. The lining cells were evidently hypertrophic. Hyperplasia, however, was encountered in the basal area where the gland fundi were large and prominent. Invasion of the glands into the superficial muscle fasciculi had occurred. The supporting endometrial stroma was congested and focally hemorrhagic. The muscle coat showed hypertrophy in the inner half. The capillary sinusoids were numerous. The vascular area showed an increment of the fibrous tissue ratio. The arteries showed physiologic sclerosis.

The left tube was normal. The left ovary was small and elliptical and measured 3 by 1 by 1 cm. The tunica was thickened and corrugations prominent. On section the organ showed senile sclerosis and involution.

The right tube was elongated. The outer half, forming part of the pedicle of the ovarian tumor to be described below, was deeply injected. It measured 16 cm. in length, 3 mm. transversely at the ostium and 8 mm. through the ampullar area. The ostium was found to be patent. The fimbriae were injected. On section through the outer third congestion was noted in the mucous, muscle, and serous coats. No other pathologic changes were encountered on microscopic examination.

The right ovary was enlarged and converted into a semisolid neoplasm measuring 10 by 8 cm. (Fig. 5). The external surface was smooth and formed by a bluish gray fibrous mantle which reflected numerous underlying congested vessels. The anterior surface presented a traumatic rent incurred during operative delivery of the tumor. On cut section, the capsule of the organ measured 1 mm. in thickness. The tumor tissue proper was granular, yellowish gray in coloration and friable. Numerous large sinusoidal vessels were everywhere in evidence. Many were thrombosed.



Fig. 7.— $\times 80$ . Case 2. Reproduction of pseudofollicular spaces in an area of sarcomatoid growth. The granulosa cells are radially arranged at the periphery. The small cavity often contains serous secretion.

Microscopically the capsule of the tumor was comprised of the compressed ovarian stroma. The tumor was epithelial in type and generally reproducing a medullary or diffuse pattern somewhat reminiscent of sarcoma (Fig. 6). Moderate numbers of connective tissue trabeculae, however, indicated the epithelial nature of the growth. More centrally the tumor cells were compressed into irregular islands, by large anastomosing endothelial spaces, assuming bizarre shape and form. At the periphery of the growth, the constituent cell was small with scant cytoplasm and a poorly defined cell membrane. The bulk of the cell was filled by the nucleus which was generally round or oval in shape, deeply staining, containing abundant chromatin material. Frequent spindle shaped nuclei were encountered. In the center of the tumor, the morphology remained essentially the same, compactly crowded cell hordes were the rule. Focally, however, a follicular pattern was reproduced (Fig. 7). Vacuolated areas measuring about 15 to 20 m. in diameter were surrounded by radially arranged tumor cells. Frequently the spaces contained serum, occasionally pale collapsed nuclei of degenerating cells (Fig. 8). In other areas, branching of the nutrient ves-

sels caused tufting of the tumor cells which were directly applied to the endothelial walls. A crescentic or circular space between the tuft and contiguous tumor completed the simulation of a kidney glomerulus. Nutrition was abundant, centrally supplied by sinusoids of huge dimension and lined by a single layer of flat endothelial cells. Peripherally nutrient arteries and veins were conveyed in the connective tissue septa.

This case, therefore, presented a solid form of granulosa cell tumor with diffuse hyperplasia of cells. The physiologic prototype of the follicle was only feebly reproduced and cystic spaces were therefore not encountered. Although hyperplasia of the endometrium was noted, the basal zone was mostly involved. Vaginal bleeding was not encountered. The patient is symptom free five years after operation.

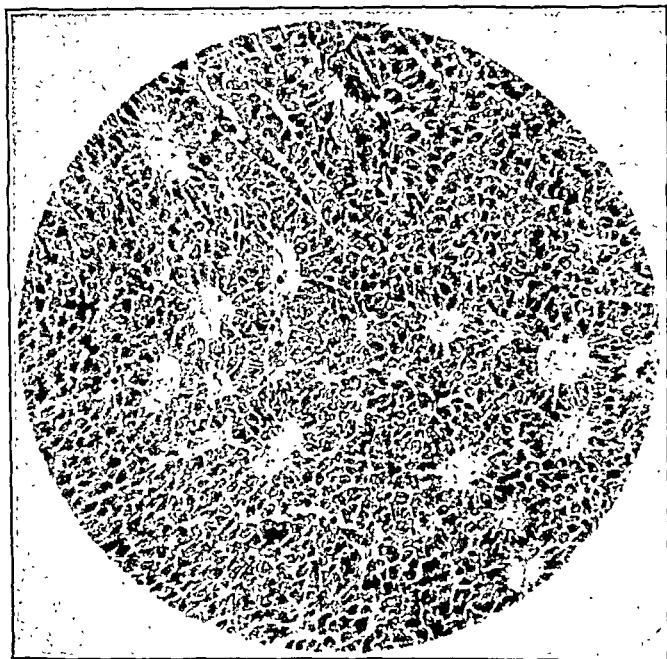


Fig. 8.— $\times 200$ . Case 2. The clear spaces mimic the ovum. The spindle-shaped granulosa cells radiate at the periphery.

#### CONCLUSIONS

1. Granulosa cell tumors are generally benign ovarian neoplasms.
2. Granulosa cell tumors of the ovary may be cystic or solid.
3. The degree of cell differentiation determines the gross and microscopic morphology and symptomatology. (a) Tumor cells fully matured reproduce the pattern of the follicle, the accumulating secretion forming cysts of varying caliber. Retention of physiologic function causes mammary and uterine hypertrophy with vaginal bleeding due to excessive follicular hormone. (b) Immature and rapidly growing tumors are solid and microscopically show a diffuse or medullary pattern. Follicles are not reproduced. Secretion is lacking. Hormone influences are not marked, vaginal bleeding, mammary and uterine hypertrophy may be lacking.

## TOXIC NEURONITIS OF PREGNANCY\*

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TOXIC neuronitis of pregnancy has been suggested by Berkwitz and Lufkin as the name associated with the syndrome of paralysis resulting from toxemia of pregnancy. This term describes the condition more accurately than peripheral neuritis, polyneuritis, or toxic myelitis of pregnancy, in that the nerve cells are involved as well as the peripheral nerves.

It is suggested by them that a careful neurologic study be carried out in all cases of hyperemesis followed by weakness. The latter symptom is usually due to the resulting inanition from continued vomiting, but the possibility of its being due to a beginning paralysis must be ruled out.

The treatment advocated is immediate interruption of pregnancy as soon as definite neurologic symptoms appear. Early recognition and treatment might reduce the mortality of this condition which has been about 25 per cent for those cases reported.

This case is reported because of the rarity of the condition and the fact that the patient was carefully observed throughout her illness, with the opportunity of watching the various stages, and ultimately obtaining an autopsy following death from an intercurrent infection. Unfortunately, however, postmortem examination was restricted to the abdominal and thoracic organs, with no information to be gained as to nerve or nerve cell pathology.

M. L., female, white, American, married, primigravida, was admitted to Cumberland Hospital July 14, 1932. Persistent vomiting for six weeks previously, started with an occasional spell which gradually increased in frequency and severity. Finally, the patient could not retain any food and was forced to seek hospital treatment.

There was no evidence of nervous system or mental symptoms at any time, and the patient was of average intelligence.

Menstruation normal, last regular period began May 1, 1932, lasted for five days, and there had been no staining since. There had been some dysuria in the previous few weeks, slight palpitation the last few days, and an occasional cough.

Physical examination revealed a well-developed woman, well oriented and fairly comfortable when not vomiting. The blood pressure was 120/80. The conjunctiva of the right eye was somewhat injected and the eyegrounds showed a slight edema of the discs and retina with some engorgement of the veins. The buccal and pharyngeal membranes were markedly congested. There was a gum-edge infection, but the teeth were in fair condition. The tonsils were cryptic and showed evidence of infection. The heart and lungs were essentially negative. The abdomen was slightly tender in the lower left quadrant, but there was no rigidity, rebound tenderness, or other abnormal sign present.

Pelvic examination revealed a nulliparous, marital introitus with no evidence of external infection. The cervix was anterior, soft, insensitive, and the external os was closed. The fundus was anterior, about the size of an eight to ten weeks'

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\*Presented before the Brooklyn Gynecological Society, April 7, 1933.

gestation, slightly sinistraverted, freely movable, smooth and symmetrical, with definite softening in the lower anterior wall. The fornices presented no gross pathology.

The patient reacted well following glucose intravenously, hypodermoclysis of saline with glucose, Harris drip, no food by mouth, and eliminating visitors. In several days frequent feedings of a high carbohydrate diet were begun, and vomiting was practically all controlled until August 4, when gagging and vomiting became marked again, and the same treatment was instituted once more. On the sixth of August an icteric tint of the sclera was noted; this became more marked for several days, then subsided, and finally disappeared on the fourteenth of August. By this time the patient was again retaining food and was out of bed on the eighteenth of August, to be discharged on the twenty-eighth of August, feeling well, and vomiting only very occasionally.

The urine on admission showed the presence of acetone, diacetic acid, an occasional hyaline cast, eight pus cells per field, and a faint trace of albumin. These findings varied throughout the patient's stay in the hospital, but prior to discharge the urine was essentially negative. The specific gravity varied from 1008 to 1020. Sugar was present on several occasions, probably transient following the administration of intravenous glucose. Bile was noted during the period of jaundice.

The blood count revealed nothing abnormal as to numbers or types of cells, or hemoglobin content. The fragility test showed hemolysis to begin at 0.45 per cent and completed at 0.27 per cent. Blood chemistry: sugar, 207 mg., urea nitrogen, 15.4 mg., uric acid, 3.6 mg., carbon dioxide combining power, 63 volumes per cent, icteric index, 14.2. Van den Bergh, delayed direct reaction, very faint trace. Blood Wassermann, negative.

Pulse was 120 after admission, dropping to about 90 and going up again when the vomiting recurred with the jaundice. The most rapid rate was recorded at 128 per minute.

The temperature was at no time above 100.4°. It was flat most of the time except the day after admission, and when vomiting returned with jaundice.

The patient was readmitted on Sept. 12, 1932, with the following story:

Soon after her discharge from the hospital she was unable to walk unassisted. This became more noticeable, and, finally, it was impossible for her to walk, even with assistance. This was accompanied by a burning sensation and soreness in the soles and calves. The condition became progressively worse until the patient could not stand without her legs giving way completely. Following this, only very slight movement of the lower limbs was possible in bed, and there was no motion of the toes of the left foot. Soon there was noticed a progressive weakness of both hands until it was not possible for her to hold her fork while eating. There was also present considerable tenderness to touch or pressure of the forearms and legs.

General examination at this time revealed the patient to be anemic, weak, undernourished, and free of pain when lying quietly in bed. There was a fine lateral nystagmus. The tongue was slightly coated, the tonsils cryptic and infected, and the pharynx slightly injected. Abdominal examination showed the uterus to be the size of a four to five months' gestation, but the fetal heart or movements were not heard. The heart and lungs presented no abnormal physical signs.

Ophthalmologic examination showed the pupils to react well to light and accommodation. Extraocular movements were normal in all directions. Diplopia was present at a distance of three feet. There was a lateral nystagmus to the left which disappeared under mydriasis. The nerve heads were normal in color, clear in outline, and there was no fundus pathology present.

Neurologic examination revealed that the reflexes were difficult to elicit because of pain. The Babinski was absent. There was a bilateral foot-drop and wrist-drop. Tenderness was elicited on pressure over most of the musculature. Sensory examina-

tion showed loss of position of the feet and hands. The touch was generally diminished. Pain and temperature were present.

Due to the very sudden onset of paralysis of the arms and legs, with pain on pressure over the course of the nerves, with wrist- and foot-drop, plus the sensory signs, the condition undoubtedly appeared to be a multiple neuritis. There were, however, two important points that remained unexplained, namely, the diplopia and the nystagmus, and it was felt that perhaps the diagnosis might prove later on to be something other than multiple neuritis.

In view of the history and findings it was deemed advisable to terminate the pregnancy. On Sept. 17, 1932, an anterior vaginal hysterotomy was performed under ethylene anesthesia, an attempt first having been made to use local infiltration which was discontinued because of the severe pain in the legs. The total operative time was fifty minutes, and the condition of the patient was good throughout. The fetus was about five months in size and was delivered with placental forceps. The placenta was removed piecemeal. A clysis of 1,000 c.c. of saline and intravenous of 250 c.c. of 25 per cent glucose was given when the patient was returned to bed. Following this she made a good postoperative recovery, and the neurologic symptoms fluctuated from day to day. In general, there was very little improvement of the latter throughout her stay in the hospital. During this time treatment consisted of sedatives for pain, high caloric diet, high fat diet, high vitamin diet, orthopedic treatment of the affected limbs, blood transfusion on two occasions, and foreign protein injections. The patient developed bronchopneumonia on December 5, and died on Dec. 12, 1932, about three and a half months after the onset of the neurologic symptoms.

The temperature was normal until the vaginal hysterotomy, following which it reached 102°, then fluctuated at and slightly above the normal line until the terminal rise. The pulse varied and reached as high as 160 at one time. The blood pressure was 146/100 on admission and reached 120/100 prior to the termination of the pregnancy. It was further reduced after operation, and was recorded as low as 96/74.

The autopsy disclosed a hypostatic pneumonia with edema of lungs, cardiac dilatation and chronic myocarditis, fibrotic stage of diffuse glomerulotubular nephritis, fatty liver with chronic passive congestion, and chronic interstitial splenitis.

889 PARK PLACE.

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## THE TECHNIC OF INJECTION OF THE PUDENDAL NERVE AND BRANCHES OF THE SMALL SCIATIC NERVE WITH OBSERVATIONS MADE ON ONE HUNDRED CASES OF DELIVERY

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IN 1928 one of the authors followed the technic of Oldham in the use of sacral anesthesia. The results were found to be too variable to be of any benefit in his hands. In 1930 attempts were made to block the sensory nerves leading from the perineum, and the results were more constant.

The type of patient in which this method of anesthesia was first employed was the sensitive primipara in the home. It is our belief that most patients require

no anesthesia during the first half of the first stage of labor, and in the home usually one is not called until there is some dilatation of the cervix with coincident pain, which is best cared for by either the psychic control of some experienced friend or relative who is present and who has borne children. It is after dilatation is over half completed that demands must be met by the attending physician to do something more to relieve the patient. In a hospital or where one is assisted by an anesthetist in the home, this need is met by the intermittent use of nitrous oxide gas. But in the private home, frequently without expert assistance, one is able to produce a fairly satisfactory local anesthesia which will meet most of the demands of both the doctor and patient, without the attendant dangers, constant attendance and specialized equipment required by most other procedures.

Of the patients receiving this method of anesthesia, 76 were private patients delivered at home, 24 were ward patients in the hospital. Over 50 per cent were primiparas who delivered themselves spontaneously. Of the multiparas, over 8 per cent required low forceps for the termination of labor. This method was used routinely where it was desired to iron out the perineum in order to prevent lacerations, where episiotomy was contemplated, for the repair of lacerations, and to preserve a previous perineorrhaphy.

The technic of injection is as follows: With the patient in the gynecologic position, locate the inner margin of the tuberosity of the ischium, and at a point on a line with the anus but close to the ischium, the tip of the needle is inserted in the direction of the spine of the ischium, which is palpated by the fingers of the opposite hand through the vagina or rectum. The tip of the needle when inserted about 5 cm. encounters the resistance of the perineal fascia, beyond which seems to be an open cavity. The pudendal nerve leaves the pelvis through the greater sacrosclatic foramen, circles the spine of the ischium, and reenters the pelvis through the lesser foramen. Therefore, by palpating the spine with the fingers of one hand and using it as a guide, it is possible to inject the solution at the proximal edge of the spine and thereby cause complete anesthetization of the pudendal nerve and the structures which it supplies. The plunger is withdrawn in order to eliminate the possibility of entering a blood vessel. Ten cubic centimeters of one to five hundred pantocain solution is injected into this region. The needle is withdrawn until its tip is free from the perineal fascia, and then is redirected upward and outward onto the face of the tuberosity of the ischium where the remaining 3 to 5 c.c. of solution is injected. This solution is massaged upward over the surface of the tuberosity, through the potential space existing between the gluteus maximus muscle and the tendinous insertions of the extensor muscle groups thereby anesthetizing the perineal branches of the small sciatic nerve which are constantly present in this space.

In a series of 100 cases we have found that: The results were constant, a complete anesthesia to pain sense is manifested in all the structures composing the floor of the perineum including the lower third of the vagina and the posterior half of the labia majora, the perineum may be "ironed out" painlessly, as well as sutured. Outlet forceps are practical in certain cases if used carefully. It will not relieve the nervous apprehension present in many patients, the high back pain or the strain, fatigue and associated pain of the diaphragmatic and recti muscle contractions. The procedure does not interfere with uterine contractions or produce a flaccid palsy of the perineal muscles. Every sensation is present except the sense of pain attending the dilatation and traumatism of the soft parts, and it is frequently necessary to question these patients as to their ability to differentiate between pain and tactile sense before they become convinced of the relief afforded them. It is impossible to perform version or obtain any relaxation of the uterine musculature. The time of injection is not until the head is on the perineum and the membranes are ruptured and every assurance is offered that the continuance of labor will not



exceed four and one-half hours which is the average duration of this anesthetic with 1 c.c. of one to one thousand adrenalin added. Its effect, without adrenalin, continues for two hours.

In the event of failure to obtain anesthesia on the patient's right side owing to the fact that the operator's left hand cannot be used very satisfactorily as a guide on that side, a second or further injections may be made without any injurious effects.

Morphine sulphate may be used to relieve the pain and nervous apprehension during the first stage of labor. Combined with gas in highly nervous patients, dilatation of the perineum is more readily accomplished.

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## INTRAVENOUS PITUITARY EXTRACT IN THE LOW CERVICAL CESAREAN SECTION

### A REPORT OF ONE HUNDRED CASES

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**F**IRM, immediate contraction of the uterus after the extraction of the baby, is a distinct advantage when performing laparotrachelotomy. If the uterus remains flaccid and boggy, free bleeding occurs from the incision, obscuring the operative field and depleting the patient. Repeated massage of the fundus is necessary, a time-consuming, troublesome procedure.

A poorly contracting uterus frequently causes some difficulty in the delivery of the secundines and not rarely the hand must be introduced into the uterine cavity to separate and remove the placenta or membranes.

The action of the uterus during the operation determines to a large degree, the type of convalescence. A flabby fundus with excessive bleeding prolongs the operating time, increases the amount of anesthesia and predisposes to shock, postpartum hemorrhage, vomiting and distention. It also induces diminished resistance to infection. Lactation is usually interfered with and a period of semi-invalidism of weeks or even months may follow.

On the other hand, a uterus which shuts down firmly as soon as the fetus is delivered, permits rapid suturing with a minimum of handling and tissue trauma and a blood loss which is negligible. The post-operative period is usually smooth and uncomplicated, with very little vomiting and distention. Except for the abdominal incision, these patients, as a rule, have a puerperium comparable to that following a normal pelvic delivery. The latter conditions seem to follow more frequently when pituitary extract is administered by vein.

## DOSAGE AND TIME OF ADMINISTRATION

Pituitary extract, 0.5 c.c. diluted with 3 c.c. warm normal salt solution is injected slowly into a vein in the elbow. The bladder having been stripped off the lower uterine segment, the latter is incised transversely with a knife, down to the membranes. As soon as this incision is started, the intravenous injection is begun. This allows the operator sufficient time to complete the incision (with bandage scissors—Phaneuf technic), rupture the membranes and slip the left hand under the baby's head. This hand maintains cephalic flexion and acts as a shoehorn so that the now firmly contracting uterus, occasionally aided by pressure on the upper abdomen, forces the head through the uterine incision. Instruments to rotate or extract the head are entirely unnecessary when this technic is employed. Gynergen one ampule is given intramuscularly after pituitary extract.

At first 1 c.c. of pituitary extract was used. In some cases bradycardia and cyanosis resulted, so that this dose was considered to be excessive. No harmful effects have been observed since the dosage has been reduced.

## RÉSUMÉ OF 100 CASES

One hundred transverse cervical cesarean sections, with intravenous administration of pituitary extract, were performed on 84 patients. Two women in the series were sectioned 3 times and 5 had 2 cesarean sections.

These were done for the following indications:

Cephalopelvic disproportion	59
Eclampsia	2
Other toxemias	14
Placenta previa	6
Cervical stenosis	2
Cardiac disease	3
Previous cesarean section	9
Previous myomectomy (during pregnancy)	2
Obstructing fibroid (Porro)	1
Abruptio placentae (Porro)	1
Complete perineal repair	1
	<hr/>
	100

In patients with a marked hypertension, pitocin was employed. The intravenous stimulation was a tremendous help in the placenta previa cases, in whom troublesome bleeding frequently occurred before the intravenous technic was adopted.

## ANESTHESIA

Ether	77
Spinal anesthesia	6
Local anesthesia	17
	<hr/>
	100

Spinal anesthesia was used principally when pulmonary complications were present. Local anesthesia, with preliminary medication

with the barbiturates, was employed in the toxemic, nephritic and pre-eclamptic, and the cardiac cases. A small amount of  $\text{NO}_2$  was administered in the latter for delivery of the head, as the stretching of the lower uterine segment cannot be entirely controlled by local anesthesia. The uterus contracts so much better, when local or spinal anesthesia is employed, that the advantages of intravenous pituitary medication are far greater when ether is used.

## RESULTS

Excellent	91
Good	7
Poor	2
	<hr/>
	100

The failures were: (1) Para iv, preeclamptic toxemia, abruptio placentae, no labor, with hemorrhagic infiltration of myometrium, preventing uterine contraction, hysterectomy. (2) Para ii, aged thirty-five, myomectomy at three and one-half months. Lower uterine segment extremely vascular. Considerable hemorrhage, repeated massage and two extra doses pituitary extract necessary.

There were no maternal deaths, no stillbirths and three neonatal deaths in the series. There were no cases of postpartum hemorrhage.

Although I have not yet had occasion to use it for that purpose, the excellent results observed in the above series would seem to indicate that intravenous pituitary extract would speedily control a postpartum hemorrhage which would not respond to the usual treatment.

524 COMMONWEALTH AVENUE

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## HYDROPS TUBAE PROFLUENS COMPLICATING CHRONICALLY PERFORATING APPENDICITIS, WITH A REPORT OF A CASE IN A GIRL OF TWELVE YEARS\*

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GRAVES,<sup>1</sup> of all the authors writing on gynecological subjects seems to stand alone in stressing the importance and devastating sequelae of appendiceal episodes in young girls. All too often vague pains in the abdomen which are not followed by the textbook syndrome of nausea and vomiting with rigidity, peritoneal reflex, etc., are dismissed, particularly in young girls approaching the menarche, as symptoms of beginning menstrual function and are considered of no great significance. That such a view is erroneous and if followed as a routine in practice will occasionally result in disaster for some youngster is the motive which compels me to report the following case. It will serve as an example of the grave consequences which may follow a neglected appendicitis in young girls.

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## CASE REPORT

The patient, white, 12 years of age, complained of pain in the abdomen for 36 hours, with fever for 24 hours, followed by nausea and vomiting.

The girl had chickenpox at the age of eight, quite severe and was confined to bed for ten days; she felt below par and was kept out of school for an additional two weeks; she had measles at the age of eleven, followed by a severe cough for two weeks. At the age of ten she had an attack of pain in the epigastrium followed in twenty or thirty minutes by nausea and vomiting. The pain then localized in the right lower quadrant. In eight to twelve hours the patient felt perfectly normal and nothing was done about it, her parents thinking she had a dietary disturbance. She had a similar attack while in Washington two months later, at which time she was seen by a physician who thought she had intestinal influenza. Several months later she had a similar attack. She was taken to a pediatrician in Baltimore, who did not see the patient until the second day after the third attack, who told the parents that everything was perfectly normal at that time. Since then she has had three similar attacks making six attacks over a period of two years. These attacks have all been alike but seem to be coming with less frequency during the past eight months. The general sequence of events in all the attacks seemed to be pain in the epigastrium followed in about thirty minutes by nausea and vomiting followed by pain low in the right quadrant. She thought she never had had any fever. She did not remember pains in the lower left quadrant similar to the pain in the lower right quadrant. The attacks nearly always came on at night time and subsided in from eight to twelve hours. The next morning she was hungry and felt like getting up and going to school. At no time during these attacks had her bowels been constipated and always the parents thought they could trace the trouble to something she had eaten. On the tenth of September the patient began to flow with a dark, thin, bloody discharge, which lasted for three days. There were no pains or cramps associated with this and her mother thought it was the onset of her normal menstrual cycle.

She has not flowed except as noted above. On September 15, the patient felt sick, she did not want anything for dinner and went to bed about seven in the evening. About midnight she was awakened by quite a severe cramplike pain in the epigastrium, followed in about twenty to thirty minutes with nausea and vomiting, and then localized pain in the right lower quadrant of such severity that she had to flex her thigh on her abdomen for comfort. Her mother put an ice bag over her abdomen and a little later the patient had a chill, so the ice bag was discarded for a hot water bottle. During the rest of the night the patient dozed and by morning seemed to feel some better and was hungry. There was no localized pain, only a soreness in her abdomen when she moved in bed. Although hungry she was given nothing but a glass of milk. That afternoon her temperature was 101.5° F. Wednesday evening she had a normal bowel movement and began to flow again with the same thin, dark, bloody fluid. The following morning, September 17, her temperature was 102° F. We saw her at noon, September 17, about thirty-six hours after onset of attack. At that time patient appeared very sick. Her face was drawn and pinched, with a mask-like expression characteristic of peritonitis and dehydration. Skin was dry and hot, temperature 102.6°, pulse 140, weak and thready. Abdomen was distended, particularly in the lower portion. Percussion note was tympanitic. Palpation revealed slight rigidity, the abdomen had a doughy feeling with muscular guarding in lower abdomen on both sides and peritoneal reflex tenderness over the same area. Two hours later the patient appeared clinically better, although her abdomen was more tender. She was not so dehydrated and toxic.

Three and a half hours after she was first seen there was definite rigidity over the right lower quadrant with point tenderness at McBurney's point. She was still tender on deep palpation over the whole lower abdomen and the peritoneal reflex was marked. Rectal examination revealed moderate tenderness in culdesac. The hymen was intact. Urine negative, blood count showed leucocytes 22,300, with polymorphonuclears 89, and lymphocytes 11.

Blood sedimentation index 24. The impression was an acute appendicitis, probably perforated, with localized pelvic peritonitis.

She was taken to the hospital for operation four hours after she was first seen.

Operation was done under gas-oxygen-ether anesthesia. The patient was prepared with sodium amytol 0.19 at home before being moved to the hospital, then morphine sulph. 0.010 and atropine sulph. 0.00015 one-half hour before operation. Patient was placed in modified Trendelenburg position and a right rectus incision was made just below the level of the umbilicus about 8 cm. in length. Rectus was displaced laterally, peritoneum was incised, and a moderate amount of serous fluid escaped. The small intestines and cecum were seen to be inflamed and covered with a granular exudate. The appendix was found to be firmly adherent to the cecum by a large amount of dense fibrinous exudate about the base. The appendix was freed from the cecum by blunt dissection. A small perforation was found on the under surface of the appendix where that organ joined the cecum. This perforation was partially closed by the old fibrinous exudate. The appendix was removed by taking a small section of the cecum in order to include the perforation at the base of the appendix; the cecum was grasped in a Mayo clamp across the base of the appendix and crushed, a tie was then placed and transfixed through the serous coat of the cecum, the appendix was then crushed and removed by cutting, the stump was cauterized and the whole turned in by a continuous suture. The pelvis was then explored. The right tube was large, edematous, and filled with fluid which was held by the occluded fimbriated end. This tube was about 4 cm. in diameter with only the distal two-thirds involved. The left tube was found deep in the pelvis, estimated to be about 8 by 18 cm. and contained about 1,000 c.c. of serosanguineous fluid. The right ovary was intact but the left was included in the hydrosalpinx and degenerated. Both tubes were removed by clamping and cutting, the edges sutured with a running No. 1 plain catgut. The proximal one-third of the right tube was left in situ, no attempt being made to form a new stoma in the presence of the inflammatory process. All raw surfaces were carefully peritonealized. It was not deemed wise to prolong the operation in order to properly suspend the uterus. The peritoneum was closed with a running No. 2 plain catgut, the fascia with interrupted figure-of-eight chromic No. 1 and the skin with clips. Drainage was not instituted.

Pathologic Report.—(1) Appendix showed thickened walls, eroded mucosa, and much round cell infiltration. Diagnosis: appendicitis, subacute. (2) Both tubes were greatly enlarged, one about four times the size of the other. The fimbriated ends were thickened and sclerosed, average about 15 mm. in diameter. The walls were rather edematous and contained a few plasma cells, lymphocytes and circumscribed areas of pus cells, giving the appearance of miliary abscesses. The lumen was greatly enlarged. The folds of the mucosa were thickened both by an increase in the central connective tissue and some proliferation of the epithelium. The serous coats were heavily infiltrated with round cells. There was a slight amount of purulent exudate in the lumen and around the villi. No organisms were found. The process was essentially a perisalpingitis. Diagnosis: Salpingitis, chronic, with acute exacerbation.

## COMMENT

In the foregoing case report, attention is directed to a preventable tragedy which is, fortunately, an uncommon occurrence but one which must be charged to oversight. From the appearance of the cecum and pelvis, i.e., a perforating lesion of the appendix which itself was involved in an inflammatory reaction and the sealing off of the fimbriated ends of both tubes with the production of a small hydrosalpinx on one side and a massive one on the other with involvement of the distal portions of both tubes and a pathologic process which is essentially a perisalpingitis, there can be little doubt but that the whole process was secondary to repeated attacks of appendicitis. The appendix had probably perforated previously during one or more of the attacks noted as extending over the past two years, and at that time started the pelvic involvement. Had a diagnosis been made and the appendix been removed during the initial stages of this process the extensive sequelae noted at operation would not have resulted. That the uterine flow was not true menstrual bleeding, but was the discharge of secreted fluid from the overdilated hydrosalpinx was concluded from the fact that some of this discharge was saved preoperatively and compared macroscopically with the serosanguineous fluid from the tube and found to be identical. Furthermore, since operation fourteen months have elapsed without the appearance of menstrual bleeding. Smears from the cervix have been negative for gram-negative diplococci and culture of contained fluid was negative.

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DYSTOCIA DUE TO CARCINOMA OF THE RECTUM AND  
OF THE VAGINA

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## CARCINOMA OF THE RECTUM

CARCINOMA of the rectum is seldom the cause of dystocia. Nijhoff,<sup>7</sup> in 1905, collected 26 such cases and there have been several more recent reports: Katz,<sup>4</sup> Delrez,<sup>2</sup> Florence.<sup>3</sup> Katz and Kaspar<sup>5</sup> have also contributed an excellent discussion of the subject from the surgical and therapeutic point of view.

CASE 1.—Mrs. L. W., aged thirty years, Hospital No. F10567, was admitted Dec. 10, 1931, in the ninth lunar month of the third pregnancy because of cardiac decompensation based upon an old rheumatic heart condition. Nothing unusual was noted on rectal examination, and there was no history of bleeding from the rectum. The cardiac condition responded well to bed rest. Early on the morning of Jan. 8, 1932, nearly a month after admission, the patient had a sudden sharp pain in the lower back while urinating and was scarcely able to return to bed. Urgency appeared, and later in the morning continuous abdominal pain developed. Gastric lavage was employed and about two liters of greenish fluid were obtained. The abdominal pain gradually increased and became intermittent in character, arousing the suspicion that labor had begun. The abdomen was soft but not tender. The uterus was so resistant it was impossible to palpate the fetus. However, the fetal heart was strong and easily heard in the left lower quadrant. Rectal examination revealed a symmetrical mass, thought to be the fetal head, practically filling the pelvis. As neither fontanelles nor cervix could be felt, vaginal examination was done, and the cervix located high up behind the symphysis, about two fingers dilated. The

fetal head was floating above the pelvic brim. Multiple pregnancy having been ruled out by previous findings, the mass felt on rectal examination was obviously a tumor approaching the size of a fetal head. The patient appeared decidedly ill; the temperature was 100.4° F., the pulse 120 per minute. Cesarean section was decided upon because of the pelvic obstruction. The peritoneal cavity contained flecks of fibrin and a few drops of frank pus. The uterus was very tense, but otherwise appeared normal. A classical section followed by subtotal hysterectomy was performed, and a living 2750 gm. female child was obtained. Exploration of the lower abdominal cavity and pelvis revealed a tumor mass the size of a small grapefruit in the rectal wall 3 to 4 cm. above the floor of Douglas' pouch. Obviously, this mass had become palpable on rectal and vaginal examination only after the tense uterus had forced it down in front of the fetal head. The tumor could not be removed nor its nature ascertained, so the abdomen was closed with drainage

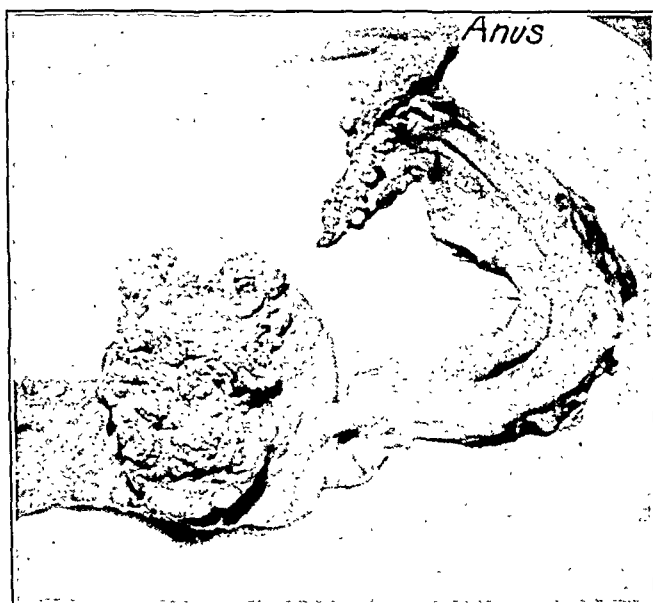


Fig. 1.—Adenocarcinoma of rectum. The normal mucosa of the opened bowel is evident above and below the tumor mass which is 8 to 10 inches from the anus.

from above because of the peritonitis. Death ensued on the third postoperative day. Postmortem findings included generalized peritonitis, endocarditis, and an adenocarcinoma of the sigmoid [located 8 to 10 inches above the anal orifice] which had perforated into the abdominal cavity (Fig. 1).

#### COMMENT

The true nature of the tumor was not diagnosed until autopsy, pregnancy having effectively masked all symptoms of its malignant character. Although no history of bleeding from the rectum was obtained, it is possible, had attention been directed to the gastrointestinal tract, that a more careful anamnesis would have given a clue to the true state of affairs. It is doubtful, however, whether the prognosis would have been altered, even if the disease had been recognized shortly after admission.

#### CARCINOMA OF THE VAGINA

Primary carcinoma of the vagina in itself is sufficiently unusual to have merited case reports as recently as 1931 (Moench,<sup>6</sup> and Thévenard<sup>8</sup>), while only two reports of dystocia caused by this type of tumor were found after a search of available indices (Audebert and Estienny,<sup>1</sup> and Tuft<sup>9</sup>).

CASE 2.—F. C., single, a primigravida, aged twenty-one years, Hospital No. G1330, was admitted Feb. 10, 1932, in the tenth lunar month of pregnancy. The last menstrual period occurred May 23, 1931. In November, 1931, and again in December there had been a bloody vaginal discharge lasting three to four days and requiring five to six pads per day. A whitish vaginal discharge had been noticed during the last week of January and the first week of February, 1932. On vaginal examination, a slightly irregular, firm mass, 2 to 3 cm. in diameter, was palpated beneath the

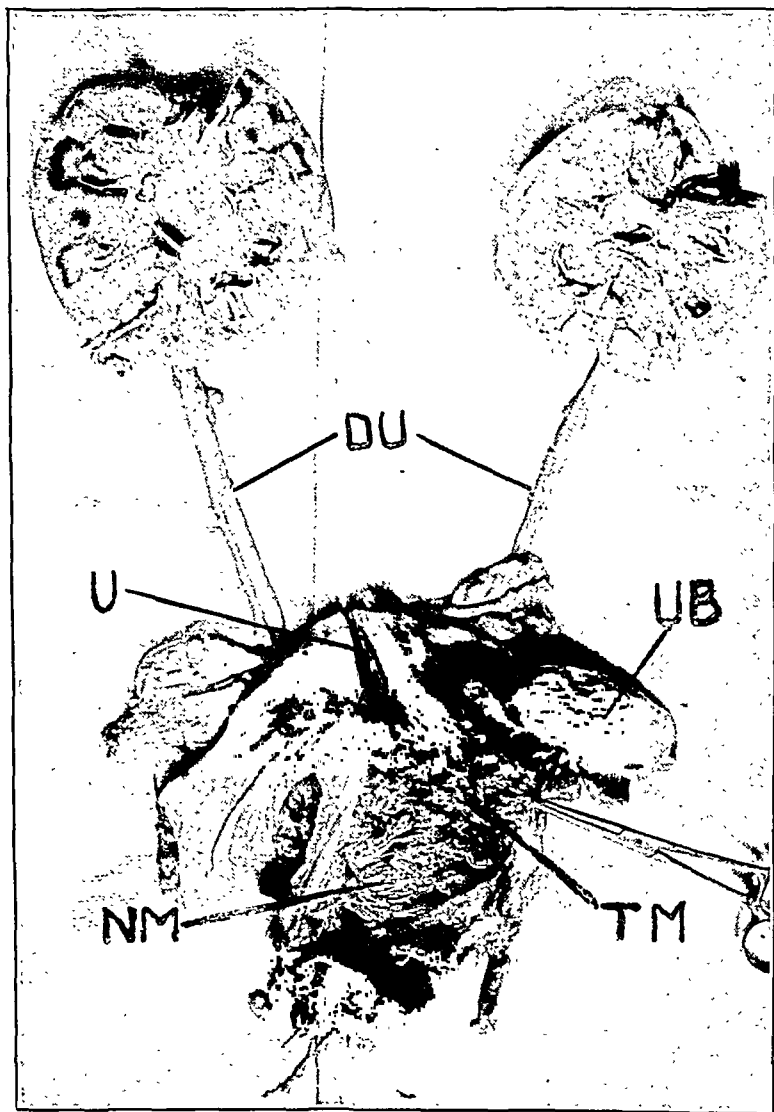


Fig. 2.—Epidermoid carcinoma of vagina. Showing dilated ureters and kidney pelves. *DU*, dilated ureters; *U*, uterus; *UB*, urinary bladder opened and pulled to the left; *TM*, tumor mass; *NM*, normal vaginal mucosa.

mucosa in the upper left fornix of the vagina. The mass seemed free from the mucosa, but was thought to be attached to the underlying structures. The cervix was normal to palpation and appearance. The vaginal mucosa over the mass was slightly reddened, but otherwise normal. It was the consensus that the tumor was probably a cervical fibroid which would not complicate labor since it would rise with the formation of the lower uterine segment. Shortly after admission, the patient com-



plained of soreness and aching in the lumbar region, but had no symptoms referable to the tumor, except that on Feb. 26, 1932, there was vaginal bleeding sufficient to soil one pad. Pains began spontaneously March 4, 1932. After thirty-six hours of hard labor, vaginal examination showed the cervix 9 to 10 cm. dilated and very thin. The tumor mass was considerably larger than previously, and in the same location. Cesarean section was felt to be unwarranted because of the length of labor, and vaginal delivery was thought possible and feasible. Forceps application was attempted but was not successful and delivery was effected by craniotomy and embryotomy. The fetus, minus the brain, weighed 4370 gm. The postpartum course was complicated by moderate fever and a white watery vaginal discharge. The patient was discharged on the nineteenth postpartum day, the nature of the mass still unknown, to return in two months for excision of the tumor. She returned, however, May 5, 1932, having been well only one week after discharge. Urinary retention necessitating catheterization had developed and constipation had become increasingly severe. Shortly before readmission, anorexia and headaches had developed and vomiting had occurred with every ingestion of food or water. The thin, watery discharge had persisted, and had recently been mixed with blood. On readmission the patient appeared very ill. The vagina barely admitted one finger and the vaginal wall was nodular and infiltrated. The entire pelvis was apparently involved by an extensive malignant growth, and vaginal biopsy revealed epidermoid carcinoma. The patient died eleven days after readmission, from uremia. Post-mortem examination revealed an epidermoid carcinoma which had involved the left vaginal wall and cervix, had ruptured into the peritoneal cavity, and had invaded the broad ligaments, leading to bilateral ureteral obstruction and pyelonephritis. In addition, there was generalized peritonitis and bilateral empyema (Fig. 2).

#### COMMENT

Undoubtedly, cesarean section should have been performed in the interests of the child, but was not done because the malignant nature of the growth and its true obstructive character were not recognized. Cervical fibroids of the size demonstrated at the time of admission rarely cause dystocia, and no consideration was given to the possibility of the tumor representing a vaginal carcinoma. Possibly, the antepartum vaginal bleeding, noted several times during the second half of gestation, and the reddening of the mucosa overlying the tumor should have aroused suspicion. The rapid development of the tumor with early fatal issue is noteworthy.

#### REFERENCES

- (1) *Audebert, J., and Estienny, E.*: Bull. Soc. d'obst. et de gynec. 18: 676, 1929.
- (2) *Delrez, L.*: Liege med. 21: 195, 1928. (3) *Florence*: Bull. Soc. d'obst. et de gynec. 3: 216, 1914. (4) *Katz, H.*: Arch. f. Gynäk. 143: 150, 1930. (5) *Katz, H., and Kaspar, F.*: Arch. f. Gynäk. 128: 250, 1926. (6) *Moench, L. E.*: Am. J. Obst. & Gynec. 22: 837, 1931. (7) *Nijhoff, G. C.*: Zentralbl. f. Gynäk. 29: 881, 1905. (8) *Thévenard*: Bull. et mém. Soc. d. chirurgiens de Paris 23: 336, 1931. (9) *Tuft, L.*: Arch. Path. 9: 654, 1930.

## A CASE OF RUPTURE OF THE SYMPHYSIS PUBIS DURING LABOR\*

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MRS. L. S., aged twenty-six, admitted to the hospital on July 15, 1932, with the chief complaints of tenderness over the symphysis pubis, inability to spread the legs, bleeding, and lacerations of the vagina and perineum, following operative delivery at home.

The patient was a gravida i, para i. Pelvic measurements showed a definite funnel or masculine type pelvis. Estimated date of delivery July 22, 1932. Labor began on Wednesday, July 13, in the early morning hours, and continued until early Friday evening, July 15, apparently failing to make progress. Mem-

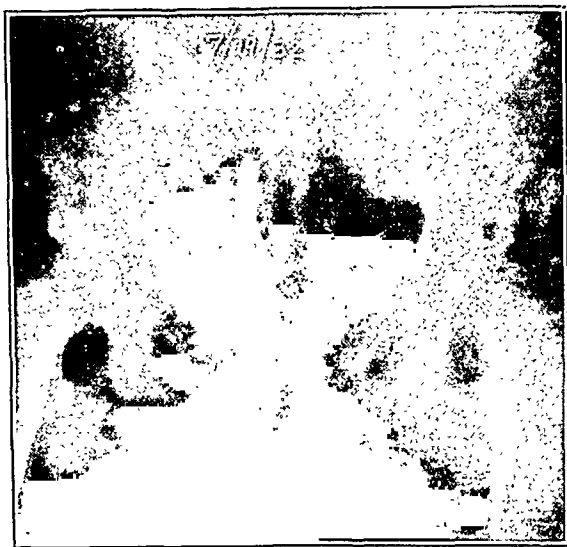


Fig. 1.—X-ray taken three days postoperative, showing a symphyseal separation of 3.5 cm. retention catheter in situ.

branes had not ruptured. Position R.O.P. Accoucheur then attempted to deliver patient by forceps at home. During delivery a "snapping" noise was heard following which the child was delivered dead. Unfortunately, an autopsy could not be obtained to ascertain the exact craniocerebral condition causing death. Previous to occurrence of separation of symphysis pubis no progress could be made, even with forceps. Patient brought to hospital for treatment and vaginoperineal repair.

Symphysis pubis had separated about 4 cm. and was tender. Vaginal examination disclosed a laceration through the anterior vaginal wall, running upward on the right side of the urethral canal to the separated edges of the symphysis pubis. The urethra was intact and there was no lesion of the bladder, as shown

\*Read before the North Hudson Hospital Clinical Society, October 13, 1932.

by catheterization. The posterior vaginal wall showed a laceration extending from the fourchette to the cervix; there was a second degree laceration of the perineum and several minor vaginal wounds.

Under gas oxygen ether anesthesia, a complete repair of the vaginal lacerations was done. A long cigarette-drain was inserted into the sinus-like wound leading to the joint and a Pezzer catheter introduced into the bladder. Then a circular strap of adhesive plaster, 15 cm. wide, was snugly tied around the pelvis. The following day, patient was laid on a Bradford frame.

A radiogram taken on the third day postoperative showed a separation between the pubic bones of 3.5 cm. (Fig. 1.) The sacroiliac synchondroses showed increased spacing, particularly on the left side. The fifth lumbar vertebra was sacralized. Cigarette-drain was removed on the fourth day; lochia had no foul odor, and there was no purulent drainage from the sinus. Patient, however, felt uncomfortable and complained of a numb feeling in the external genitalia, pelvis and thighs, especially the left thigh. We thought that the Bradford frame was not helping the condition and therefore ordered that the patient be removed and placed in a hammock sling, suspended on a Balkan frame by a counterweight

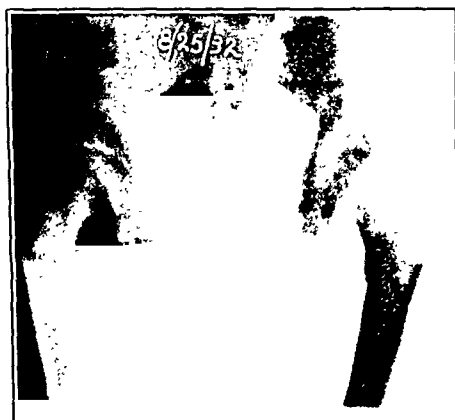


Fig. 2.—Six weeks postoperative, shows a fair apposition of the symphysis and normal sacroiliac joints.

of 48 pounds. At the time of the reduction of the rupture, before full traction was applied to avoid injury to the urethra, special care was taken to draw it downward, away from the symphysis, by means of short metal catheter, inserted into the urethral canal. Patient then became decidedly more comfortable, the pain at the symphysis having disappeared and that at the sacroiliac regions having decreased. A week later (July 25) another radiogram showed a reduction almost to normal of the symphyseal separation, but the right pubic bone appeared displaced upward about 0.5 cm. Traction was then applied on the right leg and a subsequent x-ray, on July 29, showed that the upward displacement of the right pubes was not over 3 mm. On August 9, patient was temporarily removed from sling and another radiogram showed that "separation of the symphysis and the relations were not as good as in the previous examination when patient was in the sling." (Dr. Edwards.) She was then again put on the sling where she remained twelve more days. On August 19, patient was taken out of the hammock and advised to lay on her side; the same day, a sacroiliac belt of the Mayo type was put around her pelvis and she was allowed to get up and attempt a few steps. The following day she was able to walk about and in a week (August 26, exactly six weeks after admission) she was discharged as cured. The last radiogram (Fig. 2) showed a fair apposition of the symphysis pubis and

a normal one of the sacroiliac joints. My last examination (August 23) reads: "Perineal lacerations completely healed, the vaginal canal is perfectly healed, no scars palpable at the site of the lacerations. The uterus is about the size of two and a half months' pregnancy (subinvolved). The cervix admits the tip of the finger and presents a laceration of its left side, about 1 cm. in length. The fornices are soft and free from exudate. The symphysis pubis seems to be fairly well united by a firm band of fibrous tissue."

On follow-up examination, about two months after discharge from the hospital, the patient showed a steady normal gait, there was no pain on deep pressure over the symphysis, where one felt a sort of fibrous bridge. No limitation of passive as well as active movements of legs and thighs was present.

346 PALISADE AVENUE.

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## SARCOMA OF THE UTERUS COMPLICATING PREGNANCY

M. G. DERBRUCKE, M.D., BROOKLYN, N. Y.

A SURVEY of the literature demonstrates an incidence of approximately 0.4 per cent pregnancies complicated by fibroids, while about 1 per cent of all myoma operations are associated with unsuspected pregnancies. If we consider the percentage of sarcomatous degeneration of fibroids, we find a striking similarity. Masson, in a review of 4,322 myoma operations at The Mayo Clinic found 44 cases of sarcoma, or 1 per cent. Asehoff likewise reports 1 per cent; Ellice Macdonald 7 in 700; Vogt 8 in 1,216 or 0.6 per cent.

If 0.4 per cent of all pregnancies are complicated by fibroids and only 1 per cent of all fibroids degenerate into sarcomas, then the number of pregnancies arising in sarcomatous uteri or uteri containing sarcomatous degenerated fibroids must be exceedingly small. Indeed, the condition is so rare that in the literature of the past sixty years only three cases have been recorded.

In 1885, Bernardy reported a gestation in a sarcomatous uterus simulating ectopic pregnancy. This patient, who aborted at the end of the fifth month, during a severe pneumonia, subsequently died about two and one-half months later following an attack of pleurisy with effusion and ascites. Autopsy revealed an enlarged uterus, whose musculature was entirely replaced by an adenosarcoma.

In 1897, Eastman reported a fibrosarcoma of the uterus complicating a three months' pregnancy. This patient had had an attack of pain with the appearance of a tumor mass in the abdomen, one year previous. When she conceived, the tumor reappeared and with it a temperature of a sapremic type. At operation the uterus was 3 times the normal size and the seat of a large tumor of the fundus. A porro-hysterectomy showed a fibrosarcoma complicating a three months' pregnancy.

In 1922, Paul Nisot likewise reported a pedicled, sarcomatous, degenerated fibroid complicating a four months' gestation. He did a subtotal hysterectomy because of the rapid enlargement and pain.

In my case, although the symptoms were similar to the foregoing, in that there was a sudden attack of pain and the appearance of a tumor mass, there was as little time lost between the onset and the operation as was deemed safe. Likewise the procedure was radically different.

Mrs. M. P. presented herself on Sept. 4, 1930, with a history of pain in the lower right quadrant, for the past three days. She was thirty-two years of age, had been married two years and had had no previous pregnancies. Menstrual periods began at thirteen, regular, every twenty-eight days, four days' duration, moderate flow, no

pain. Last period May 18, 1930. Family history negative, except father died twenty-four years previously from tuberculosis. During the past three months she had some lumbosacral backache and increased frequency of urination with terminal pain. There was no nausea or vomiting, appetite and general health were good. Bowels were regular.

About three days prior to the time when I first saw the patient, while at rest, she was suddenly seized with pain in the right lower abdomen, and soon thereafter felt a lump in this region. She could not stand erect because of the stiffness in the right lower abdomen. She was not ill otherwise. The following morning the pain disappeared but recurred in the afternoon and had been present since. Aside from these symptoms the rest of her history was essentially negative.

Physically, she was well developed and well nourished. The pulse was 80, temperature 99.2° F., respirations 23. Her head, eyes, ears, nose mouth, and neck were negative. The abdomen was slightly protuberant, with a smooth, regular mass

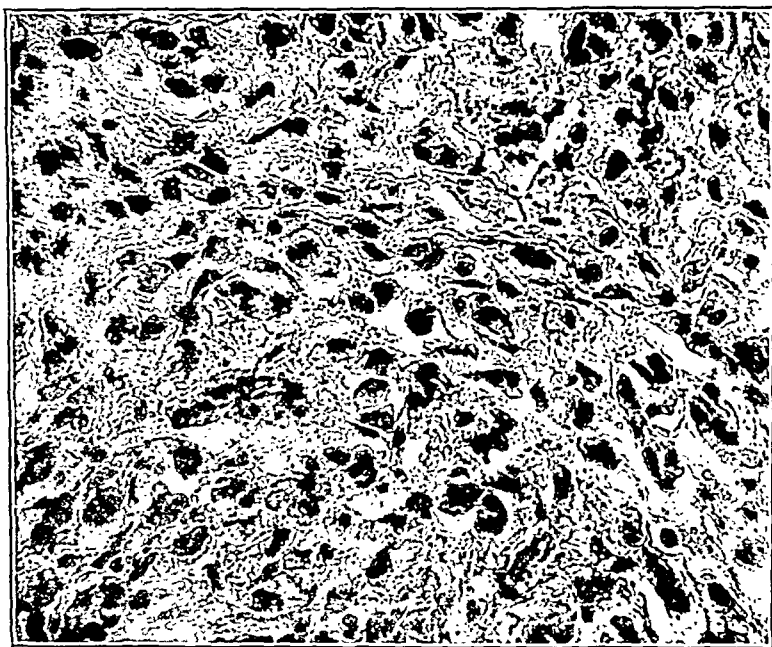


Fig. 1.—Showing fusiform, and oat-shaped cells; with amitosis and mitotic figures. (mag. 350X)

palpable in the hypogastrium. There was another irregular mass in the region of the right inguinal canal, distinctly separated from the one in the hypogastrium, very tender. There were no other palpable masses. The pelvic measurements: intercrystal 28 cm., interspinal 26 cm., external conjugate 21 cm., diagonal conjugate 12-plus, bisischial ample.

Pelvic examination revealed the introitus and vagina normal. The cervix was normal in shape and size, soft in consistency, very tender on motion. The uterus was in normal position. Enlarged to the size of a small orange, distinctly separated from the uterus, and on a level with the fundus in the neighborhood of the right cornu, was the mass felt through the abdominal wall. The left adnexa were not palpable. The diagnosis of twisted ovarian cyst was made, and hospitalization advised. She entered the hospital later that day.

The next day the mass felt slightly larger, definitely more tender and painful. The fundus and body of the uterus seemed larger. The blood pressure was 120/70; blood count: 3,750,000 R.B.C., 13,200 W.B.C., 87 per cent polymorphonuclears, 11

per cent small lymphocytes, 2 per cent transitionals, hemoglobin 70 per cent, and sedimentation time twenty-five minutes. The urine was essentially negative. That evening, the mass became more tender and the pain more diffused over the fundus of the uterus. In view of the persistent and increasing severity of the pain, together with the blood picture, operation was decided upon. Accordingly on the morning of the sixth day after the onset, under gas, oxygen, ether anesthesia a low median laparotomy incision was made. Immediately beneath the line of incision, a three and one-half months' pregnant uterus presented. Just to the right of the median line of the fundus was a fibroid tumor the size of a small orange, twisted on a pedicle a half inch long. Just above and behind this tumor was a normal ovary and slightly congested tube. The mass was easily removed by shelling it out of its capsule and ligating the pedicle. The raw surfaces were peritonealized.

Immediately upon return to bed, she received 60 c.c. of mineral oil suspended in 1000 c.c. of 5 per cent glucose as a retention enema, and was kept morphinized for the next forty-eight hours. Except for some slight abdominal pain on the following afternoon and an initial rise of temperature to 100.8° F., and a pulse of 104, her convalescence was uneventful.

On Feb. 3, 1931, five months after operation, she went into labor, and about five hours later, spontaneously delivered a live, normal, 6 pound, female infant. Bleeding was moderate. There were no gross irregularities of the uterus palpable.

The pathologic report of the tumor removed at operation on Sept. 6, 1930, was made by Dr. W. W. Hala.

Sections showed marked fibrous connective tissue reaction with peculiar oat- and spindle-shaped cellular invasion, some arranged in fascicular manner. Some embolic phenomena in blood vessels and lymph spaces, with marked edema of the tissue. Cellularity suggestive of myosarcoma. *Diagnosis:* Myosarcoma.

The question of what to do with this uterus arose with the establishment of the true diagnosis of myosarcoma. Wagner, Patel and Eparvier, Hardouin and Brault, have shown that sarcomas, although dormant, and unsuspected, do, during the pregnant state, suddenly become activated, grow rapidly, and may prove fatal. Wagner, likewise has shown that early interruption of the pregnancy may aid in halting the growth of the tumor. Winckel, in 1872, reported the removal of a retroperitoneal sarcoma from a patient, three weeks after the fifth confinement, with complete recovery. In my own instance, it was felt that the sarcomatous degeneration had not extended beyond the confines of the capsule and hence no radical operation was done. The pregnancy was allowed to go on to term and delivery was accomplished in normal manner. Examination twenty months later revealed no signs of recurrence or metastasis.

In conclusion, it may be stated that any fibroid tumor which enlarges rapidly, irrespective of its size, and is the source of pain and embarrassment to the patient, should be removed. Furthermore, the simple enucleation of a fibroid tumor, even though it be the seat of an early sarcoma, provided its capsule has not been invaded, should be practiced, and the pregnancy, under careful and constant observation, be allowed to go to term.

# EXTRANEOUS FOREIGN BODIES IN THE URINARY BLADDER\*

WITH SPECIAL REFERENCE TO THEIR OCCURRENCE AMONG WOMEN

LEWIS C. SCHEFFEY, M.D., AND CHARLES LINTGEN, M.D.  
PHILADELPHIA, PA.

(From the Department of Gynecology, Jefferson Medical College Hospital)

**A** PATIENT coming under our observation during the past year occasioned the authors' interest in the above-mentioned subject.

K. H., female, sixteen, was admitted to Jefferson Hospital on May 9, 1932, because of incontinence of urine of three months' duration, initiated by frequent and painful micturition. Periods of spontaneous voiding alternated with incontinence, which was more pronounced at night. No other symptomatology presented. Prior to her admission to the hospital, the patient had been treated medically for "cystitis" for a period of three months, but a catheterized specimen of urine had never been obtained, and perhaps that is why a diagnosis was not made at an earlier date, for no history of the exciting cause could ever be elicited from her.



Fig. 1

Fig. 1.—X-ray demonstration of lead pencil in the bladder, showing calculus that had formed about its center.



Fig. 2

Fig. 2.—Intravenous pyelography demonstrating dilatation of both ureters and kidney calices, as well as pencil and calculus.

Menstruation began at twelve, and had been regular until eight months prior to admission when amenorrhea developed. No severe illnesses or operations had occurred previously. The patient was of good family and mentally alert, was extremely nervous, and showed definite loss of weight. The cardiovascular and respiratory systems were normal.

Pelvic inspection revealed normal external genitalia, with a nulliparous introitus and cervix. Upon introducing a glass catheter into the bladder to obtain a specimen of urine, obstruction of stony hardness was immediately encountered. This presumptive evidence of a vesical calculus the size of a plum was confirmed by bimanual examination, which also indicated a normal uterus and adnexa.

\*Read at a stated meeting of the Obstetrical Society of Philadelphia, March 2, 1933.

The introduction of a foreign body with subsequent calculus formation was immediately considered, but the girl denied any such possibility, or any masturbative practice as well, a denial in which she remained steadfast. X-ray examination revealed a lead pencil in the bladder about the center of which a large calculus had formed (Fig. 1). Intravenous pyelography demonstrated appreciable dilatation of both ureters, as well as a moderate degree of dilatation of the pelves and calices of both kidneys, and confirmed the position of the calculus and the foreign body in the bladder (Fig. 2). The urine contained a large amount of pus, as well as a positive culture of *Staphylococcus albus* and *aureus*. The blood chemistry and blood count were normal.

In view of the existent amenorrhea (suggesting possible pregnancy), the likelihood of a foreign body having been accidentally introduced into the bladder in an attempt to induce abortion, was likewise considered, but since the pelvic examination had eliminated this probability, the introduction of a lead pencil into the bladder through the urethra while masturbating was assumed to be the cause.

On May 12, 1932, suprapubic cystotomy was performed under gas-ether anesthesia. A lead pencil, the center of which was surrounded by a calculus, was wedged transversely in the bladder, either extremity being embedded in the wall, the attached calculus occupying most of the viscus. The pencil and calculus were

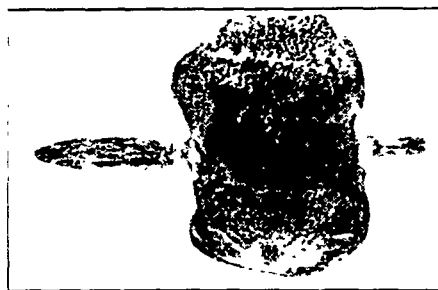


Fig. 3.—Lead pencil and calculus following removal from bladder.

disengaged, removed, and the wound closed, with rubber tube drainage in situ. The calculus and pencil weighed 80 gm., the stone measuring 5.5 by 3.75 by 3.25 cm., consisting of calcium carbonate, ammonium magnesium phosphate, and ammonium urate, while the lead pencil was 9 cm. long (Fig. 3). Convalescence was complicated by postoperative collapse (atelectasis) of the right lower lobe which was promptly detected and subsided spontaneously. The patient left the hospital on the twenty-third postoperative day, with the wound healed and urinary control reestablished. A urinary infection of *B. coli communis* was treated with an autogenous vaccine, and in September, 1932, the urine was clear and culture-free, the patient was symptomless, and had gained in weight, while menstruation had returned normally. She is in perfect health today.

#### COMMENT

1. In every case of persistent "cystitis" in women, young girls and even in children, a catheterized specimen of urine should be secured. The simple passage of a metal or glass catheter may yield valuable information, especially if the possibility of an extraneous foreign body, introduced accidentally or by masturbative procedure, is thought of.

2. A dependable history is seldom obtained in those cases where masturbation is the causative factor.

3. In cases of intractable cystitis following vaginal or pelvic operations, the possibility should be borne in mind that some article employed in the operation



may have gained access to the bladder, thereby acting as a nucleus for calculus formation.

4. Diagnostic or confirmatory evidence can be secured by bimanual palpation, cystoscopic study and x-ray examination.

5. The patient must necessarily be individualized as to treatment.

269 SOUTH NINETEENTH STREET.

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## ACUTE INTESTINAL OBSTRUCTION COMPLICATING LABOR

E. M. LAZARD, M.D., F.A.C.S., LOS ANGELES, CALIF.

*(From the Obstetrical Department of the Los Angeles General Hospital.)*

INTESTINAL obstruction complicating labor must be an exceedingly rare accident as I have been unable to find any reference to it in any of the standard textbooks. Williams says: "This rare complication of pregnancy must be treated on general surgical principles. I have seen two cases. In the first, intussusception occurred at the site of a tubercular ulcer and death followed resection of the gut; while in the second case, obstruction was due to constriction by a peritoneal adhesion in a case of tubercular peritonitis. This was relieved by operation and the patient was delivered at term, but died some weeks later from miliary tuberculosis." Berkeley and Bonney also refer to the possibility of intestinal obstruction during pregnancy and report the case of a patient who developed intestinal obstruction as a result of the "enlarging uterus dragging upon and eventually obstructing a Meckel's diverticulum, which adherent at its free end to the abdominal parietes passed through a hole in the mesentery just beyond its origin from the ileum." This patient had been pregnant once before and the uterus was emptied prematurely for the vomiting which was thought to be toxemic. In the second pregnancy, the vomiting recurred at a somewhat later date and under the same misapprehension action delayed too late the patient dying in spite of delivery.

In the September number, 1932, of the AMERICAN JOURNAL OF OBSTETRICS & GYNECOLOGY, Bemis reports a case of intestinal obstruction during pregnancy. He states that at the Womans Hospital of New York, there have been two cases including the one he reports in 15,000 obstetric cases and that in American and British literature from 1900 to the present time, 13 cases have been reported.

In his case symptoms of intestinal obstruction began when the patient was about eight and one-half months pregnant. At operation the obstruction was found to be due to "five distinct bands of firm adhesions, forming a constricting band across the cecum, just above the ileocecal junction." The adhesions were divided and the obstruction relieved. On the fifteenth postoperative day, the patient went into labor and was delivered of a full-term baby by a midforceps extraction.

I have been unable to find any report of an acute intestinal obstruction occurring during labor.

The patient had one full-term pregnancy with a living baby and one abortion, was admitted June 12, 1932, at 8 P.M. She stated that the membranes had ruptured on the evening of June 10, 1932, and that she was having pains of short duration. She had had some nausea and vomiting for the last three months. The bowels were regular. During the night she had pains at irregular intervals and vomited several times. During the day of the thirteenth she vomited several times and was given 500 c.c. of 10 per cent glucose, intravenously, and had a

gastric lavage. At 6:30 P.M. the resident noted marked distention of the colon and reported the case to me as a probable beginning intestinal obstruction. A surgeon saw the case in consultation, agreed with the diagnosis and advised immediate delivery. There had been little progress in the labor, there being only about 3 cm. dilatation of os.

By the time I saw the patient at 10 P.M. the distention involved the entire large gut.

Low cervical cesarean section under spinal anesthesia was done immediately. On opening the abdominal cavity, the intestine was found to be markedly distended. Almost as soon as the baby was delivered, flatus was passed audibly by rectum. By the time the suture of the uterine wound was completed, the intestinal distention had almost entirely disappeared.

After the bladder flap was replaced, the uterus was delivered out of the abdominal cavity. A loop of large gut, the sigmoid, was found lying posterior to the uterus and had evidently been compressed by the engaging head. There were several areas of hemorrhagic infiltration in the previously distended gut. There was no other pathology found and the abdomen was closed. The patient made an uneventful convalescence and was discharged with her baby, both in good condition, on June 25, 1932.

1930 WILSHIRE BOULEVARD

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## A WANDERING FIBROID IN THE RECTOVAGINAL SEPTUM

JEROME P. LONG, JR., A.B., M.D., MEMPHIS, TENN.

MISS L. M. A., white, aged thirty-four, unmarried, was admitted to the Baptist Memorial Hospital, Feb. 8, 1932, complaining of irregular menses, and a mass in her abdomen first noted in the summer of 1930. This mass had gradually increased in size. Menstruation was normal until October, 1931. Since then the flow had increased in amount until now her menses lasted eight to ten days, and recurred at intervals of one to three weeks. For the past four months she had had severe cramps with each period. Since November, 1931, there had been some spotting between her menstrual periods.

She was markedly constipated, and had had indigestion for several months, prior to her admission. There was no loss of weight.

A large nodular, firm, movable, nontender mass was palpable in the lower abdomen, extending from the pelvis to the umbilicus. External genitalia normal. Nulliparous introitus, pelvic floor support good. Vaginal walls were normal; cervix normal. There was a large nodular, firm, movable mass filling the entire pelvis, extending to the umbilicus in which the uterus seemed to be incorporated.

She was operated upon Feb. 9, 1932. The abdomen was opened by a lower midline incision and a large multinodular mass was easily delivered into the wound. The tubes and ovaries were normal, and a supravaginal hysterectomy was performed. After the cervical stump had been peritonealized, examination of the pelvis revealed a large mass in the rectovaginal septum. The peritoneum over this mass was opened, and the mass easily shelled out with the fingers. There was some oozing, but no frank bleeding, and no vessels had to be ligated. The peritoneum was closed, and the abdominal wall sutured in layers.

At the time of the operation, signs of a connection were closely looked for, both on the uterine mass and on the separate tumor, but none were found.

The pathologic report was as follows: The uterus consisted of a large, nodular tumor mass weighing two pounds. There was a smaller detached tumor four

inches in diameter, weighing one-fourth pound. The tumors attached to the uterus consisted of subserous and intramural tumors ranging in diameter from three-fourths of an inch to four inches. There were 10 separate tumors.

Microscopic sections from the uterine mass and from the separate tumor showed that both were fibromyomas. Although careful search was made, no signs of degeneration could be found in either the tumor mass, or in the separate fibromyoma. Each of the tumors was similar in construction, and it was concluded, that the separate tumor was of uterine origin.

The entire disappearance of the original pedicle of a fibromyoma is rare.

Tumors of rectovaginal origin were all reported as being very closely connected with either the posterior vaginal wall or the rectum.

After a very careful search of the literature, I have been unable to find any case where there has been a complete separation of the uterine pedicle without a parasitic attachment, that has not shown some degenerative changes in the tumor.

899 MADISON AVENUE.

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## PLACENTA PREVIA WITH TWINS

CHARLES D. McCANN, M.D., F.A.C.S., BROCKTON, MASS.

*(Obstetrician-in-Chief, Brockton Hospital)*

THE incidence of placenta previa is said to be one in a thousand, but P. Strassmann<sup>1</sup> found that placenta previa occurred once in every 41 cases of twins. Strassmann explains this on the basis that the larger the placenta the more likely it may become a previa. If this relatively high ratio is correct, it is strange that there are so few reported cases in our literature.

An unmarried primigravida, aged nineteen, was sent in to the Brockton Hospital on Dec. 6, 1932, on account of painless vaginal bleeding. Her history states that she was five months pregnant and that the bleeding from the vagina had begun on the day of admission. The general examination was entirely negative. Hemoglobin and blood pressure were normal. Examination of the abdomen revealed a uterus at the twenty-eighth week, whereas it was just twenty-five weeks since her last monthly period.

A fetal heart was audible in the right upper quadrant. On vaginal examination soft spongy tissue was felt protruding through the cervical os, which was dilated two fingerbreadths; a speculum in the vagina demonstrated visibly detached placenta protruding through the os.

A medium sized Voorhees bag was inserted into the uterus, care being taken to preserve the intact ovum. After four hours, labor pains began, and at the end of another four hours the patient was complaining of very severe two-minute pains. It seemed that the os was fully dilated, so the bag was removed to determine the exact condition. There had been no bleeding since the insertion of the bag. The bag was evacuated of its contents and carefully removed. This maneuver was not accompanied or followed by any bleeding.

The os was fully dilated and the membranes still intact. The amniotic sac was ruptured, and a small fetus located bobbing around in a large uterine cavity. A foot was grasped and the fetus extracted. It was chocolate colored and macerated,

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<sup>1</sup>Strassmann, P.: *Ztschr. f. Geburtsh. u. Gynäk.* 55: 40, 1931.

and estimated to weigh a pound. The umbilical cord was shrunken and of the same chocolate color. As there had been a fetal heart audible up to the time when the bag was removed, it was obvious that a multiple pregnancy existed. The cord was clamped and cut in the usual way, a hemostat remaining on the placental end of the umbilical cord.

Vaginal examination revealed another intact amniotic sac, the rupturing of which was followed by an excessive amount of amniotic fluid. During this procedure the macerated cord became separated from the placenta and fell into the catch basin. A twin was found floating around in a large uterine cavity; the uterus making no effort to shut down on its contents; the feet of the child were grasped and another small baby extracted easily. This infant was alive and estimated to weigh  $1\frac{1}{2}$  pounds. The routine injection of  $\frac{1}{2}$  c.c. of pituitrin was given intramuscularly. The uterus seemed to be of good tone and as there was no bleeding, there was no emergency apparent. Eleven minutes after the birth of the second twin the placenta was expressed, followed by very profuse hemorrhage, and at the same time the uterus disappeared from under the hand of the assistant.

Vaginal examination demonstrated a wide open flabby os, with the fundus of the uterus inverting itself through it. The inverting fundus was immediately reduced, and  $\frac{1}{2}$  c.c. of pituitrin given intravenously. Almost immediately the uterus shut down on the operator's hand. There was no further bleeding and the general condition of the patient was excellent.

*Result.*—Identical twins, males, one macerated and weighed 450 gm.; the other lived for two hours and four minutes and weighed 730 gm. Mother in good condition.

Examination of the placenta revealed that it was single in type and that only one amniotic sac could be demonstrated, although I had ruptured two apparently separate sacs; also I was unable to find where the detached macerated cord had arisen.

Convalescence was uneventful and the mother was discharged on the eleventh day postpartum.

12 COTTAGE STREET

# Society Transactions

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## OBSTETRICAL SOCIETY OF PHILADELPHIA

*MEETING OF MARCH 2, 1933*

The following papers were presented:

Spinal Anesthesia. Dr. Meyer Sabel. (See page 417.)

A Case of Foreign Body in the Urinary Bladder. Dr. L. C. Scheffey and Dr. C. Lintgen. (See page 460.)

Primary Carcinoma of the Oviduct. Dr. J. A. McGlinn and Dr. W. B. Harer. (See page 354.)

Rupture of the Cesarean Scar in Succeeding Pregnancy. Dr. W. R. Nicholson. (See page 387.)

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## BROOKLYN GYNECOLOGICAL SOCIETY

*MEETING OF APRIL 7, 1933*

Report of a Case of Neuronitis of Pregnancy. Dr. S. Lubin. (See page 442.)

Report of Two Cases of Granulosa Cell Tumors of the Ovary. Dr. S. A. Wolfe and Dr. Sanford Kaminester. (See page 434.)

Dührssen's Incisions of the Cervix. Dr. M. M. Shir. (See page 425.)

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## Item

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### American Board of Obstetrics and Gynecology

The next written examination and review of case histories for certification by the American Board of Obstetrics and Gynecology will be held, according to location of applicants, in various cities of the United States and Canada, on Saturday, December 9, 1933, at 2 P.M. For application blanks and further details, address, Paul Titus, M.D., Secretary, 1015 Highland Building, Pittsburgh, Pennsylvania.

# Department of Reviews and Abstracts

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CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

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## Selected Abstracts

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### Gynecologic Operations

**Regnault, J.:** The Use of Local and Regional Anesthesia for Vaginal Hysterectomy, *Rev. franç. de gynéc. et d'Obst.* 26: 137, 1931.

Since 1922, Regnault has used local anesthesia for removal of the uterus through the vagina whenever it was freely movable and there were no evidences of acute inflammation. The technic is the following: (1) Local anesthesia of the perineum, light if a simple hysterectomy is to be performed but more extensive if a perineorrhaphy is to be done at the same time. (2) Regional anesthesia of the anterior and posterior walls of the vagina when plastic operations are to be performed on these walls. (3) Anesthesia for the hysterectomy which embraces infiltration of the vagina around the cervix then a deep injection of about 8-10 c.c. of solution into either side of the uterus. The needle is directed upward and slightly posteriorly and is inserted about 2-3 cm. One must be certain that the needle does not penetrate a blood vessel before the injection is made. In certain cases the anesthesia is completed during the course of the operation by making two or three supplementary injections into the broad and infundibulopelvic ligaments.

Before operation the patient should be given morphin and scopolamine.

J. P. GREENHILL.

**Gragert:** Results of Antefixation of the Uterus by the Hoehne Technique, *Arch. f. Gynäk.* 146: 1, 1931.

Hoehne's method of antefixation of the uterus for retroflexion and retroversion with symptoms consist first in an intra-abdominal reefing of the round ligaments. The vesical reflection of the peritoneum is then dissected free and the bladder is held on the fundus of the uterus by suturing the vesical peritoneum to the posterior uterine wall. Following this the suspensory ligaments of the ovaries are also shortened by reefing stitches. The uterosacral ligaments are then shortened and the Douglas obliterated. The advantages claimed for this method are, first, the high percentage of success and, second, the avoidance of any possibility of postoperative ileus. It is the occurrence of the latter that has made so many of the other methods of correcting retrodisplacements of the uterus objectionable.

This method has been in use for over eleven years in the Greifswald clinic. Of 280 women examined nine months to seven years postoperative, only 6 or 2.2 per cent had a recurrence of the retrodisplacement. Only those patients were operated who complained of symptoms referable to the retrodisplacement and of these over 95% were relieved of their symptoms. This method is ideal for future pregnancies and labors. Of the 280 women 66 had become pregnant, 56 were

delivered 1-3 times with 77 living children, and 10 women had pregnancies which terminated in abortion. Two patients developed tubal pregnancies. In none of the women who became pregnant did any symptoms arise referable to the ante-fixation or to the bladder fixation.

RALPH A. REIS.

**Westman, A.:** The Results of the Operative Treatment of Prolapse of the Female Genitalia, *Acta Obst. et Gynec. Scandinav.* 11: 254, 1931.

During the last thirteen years at the Stockholm clinic, 288 cases of prolapse of the uterus were operated upon. Westman divides these cases into four groups according to the operative technic employed.

1. In 157 cases the operation consisted of anterior colporrhaphy with suture of the bladder to the cervix, high cervical amputation and high colpoperineorrhaphy. The primary operative mortality was 1.3 per cent. Follow-up information obtained chiefly by questionnaires revealed that 89.3 per cent of 140 women were free from symptoms, 8.6 per cent had slight discomfort, and 2.1 per cent had considerable pain. Perfect anatomic results were observed in 94.6 per cent of 37 women who were reexamined by the author. This incidence of successful repairs was the highest in the four groups.

2. In 69 cases the Schauta-Wertheim interposition operation and colpoperineorrhaphy were performed. The primary operative death rate was 4.3 per cent. Follow-up information indicated that 85.2 per cent were free from symptoms, there was slight discomfort in 6.6 per cent and a good deal of pain in 8.2 per cent. Among 15 women reexamined 80 per cent showed perfect anatomic results.

3. In 33 cases, anterior colporrhaphy and colpoperineorrhaphy were performed. The primary mortality was 3 per cent. There was freedom from symptoms in 70.9 per cent of 31 patients followed up, but 22.6 per cent had slight pain and 6.5 per cent had considerable discomfort.

4. This group consists of a small number of women in whom many different types of operations were performed.

J. P. GREENHILL.

**Broglio:** The Association of Rectal and Utero-vaginal Prolapse, *Arch. ital. di Chir.* 32: 126, 1932.

In those cases in which there is both rectal and uteral prolapse the author advises a two-stage operation. The first stage consists in a vaginal hysterectomy with conservation of the adnexa. The second stage, performed when the vaginal vault is healed (in his case twenty days after the vaginal hysterectomy), consists in opening the abdomen and elevating the rectum. After the pelvis is well exposed a transverse incision (8 cm. in length) is made through the peritoneum covering the area between the rectum and bladder and the peritoneum is loosened from the anterior rectal wall upward for about 3 cm. The uterine end of the left round ligament is sutured to the anterior rectal wall, and the round ligament itself then sutured to the left rectal wall along the whole denuded area. This pulls the rectum upward and to the left side of the pelvis since the round ligament is also sutured to the parietal peritoneum from the internal inguinal ring up to the level of the sacral promontory.

The same technique is used on the right side of the rectum with the right round ligament. The pelvis is then carefully peritonealized.

In the author's case this procedure gave a very satisfactory result and he recommends this operation in those cases of combined rectal and uterine prolapse in which there is no reason for conserving the uterus.

JAMES M. PIERCE.

**Sessums, Valton and Murphy: The Surgical Menopause After Hysterectomy With and Without Ovarian Conservation, Surg. Gynec. Obst. 55: 728, 1932.**

Ninety-one women, subjected to hysterectomy with retention of one or both ovaries, and 52 women, subjected to hysterectomy and bilateral oophorectomy, both groups before the age of 36 years, have been interrogated with reference to the incidence, onset, duration, and severity of the surgical menopause, as indicated by its most important symptom, the hot flush. The surgical menopause occurred in more patients, it took place sooner, and was more severe after hysterectomy with bilateral oophorectomy than when one or both ovaries were conserved.

The symptoms of surgical menopause after hysterectomy with and without associated bilateral oophorectomy still persisted in three-fourths of the patients at the time of last observation. In the remaining one-fourth menopause had been completed. Its duration was shorter after associated bilateral oophorectomy than after hysterectomy with ovarian conservation.

From this study and a previous one, it is concluded that, when hysterectomy is to be performed during the childbearing period, the best interest of the patient is guarded by conservative treatment of ovarian tissue.

WM. C. HENSKE.

**Siedentopf, H.: Investigations of the Function of the Ovaries After Removal of the Uterus, Monatsch. f. Geburtsh. u. Gynäk. 90: 197, 1932.**

Siedentopf examined 152 women from five weeks to ten years after they had their uterus removed. All of these women had menstruated up to the time they were operated upon. The author divides these cases into three groups, namely (1) those in whom both ovaries were left in situ, (2) those from whom one ovary was removed and (3) those from whom both ovaries were excised. Nearly all the women whose ovaries were not removed experienced for many years afterward regular sensations similar to those which usually accompany menstruation. Even objective signs indicated that these women continued to have a menstrual cycle. However, there was no cycle for two or three months after operation. Disturbing periodic sensations were rarely observed and only in those women who previously had dysmenorrhea and other signs of nervousness.

In the cases where one ovary was left, the end-results were practically identical with those observed in the women who retained both ovaries.

The women from whom both ovaries were entirely removed with their uterus manifested without exception after the operation, symptoms of the menopause. This indicates that in the other two groups the ovaries which were left behind were responsible for the periodic appearance of symptoms. Hence even after the removal of a uterus the ovaries continue to function for a long time in nearly all cases. Therefore the ovaries should be left in place whenever feasible.

J. P. GREENHILL.

**Payne, R. L.: Genital Prolapse Following Total Hysterectomy, Arch. Surg. 20: 637, 1930.**

After any type of vaginal hysterectomy a marked genital prolapse often happens in which the vagina becomes completely everted and the bladder partially or completely protrudes. To relieve this condition the writer on four patients has successfully done the following corrective operation: Patient is laparotomized in extreme Trendelenburg position. A Cameron light introduced into the vagina acts both as a guide and facilitates identification of structures. Bladder is freed anteriorly, broad ligaments laterally, and rectum posteriorly from va-



gina. Three purse string sutures are placed, one above the other, resulting in an infolding mass of the upper vagina, reducing its length by about one half. The broad ligaments next are obliquely brought across and fastened to vaginal wall, then are overlapped and sutured behind the bladder. Finally bladder is brought back over the constructed supports and all raw surface covered.

EHRENFEST.

**Basset, A.:** The Treatment of Perforation of the Uterus During Curettement, Bull. de la Soc. d'Obst. et de Gynéc. 10: 760, 1931.

Five cases of perforation of the uterus are reported by Basset. He mentions Liepmann's report of 226 cases of uterine perforation collected from the literature among 70 of which there were visceral lesions. The death rate in Liepmann's series was 31.2 per cent.

The author recommends that as soon as a perforation of the uterus has occurred or even when it is only suspected, all intrauterine manipulation be stopped. An intrauterine douche is especially contraindicated. A small drain should be introduced through the cervix up to the entrance into the uterine cavity and a laparotomy performed immediately. This is far safer than to wait for complications to arise. Immediate operation may permit conservative suturing but hysterectomy must be performed when the damage to the uterus is extensive, and when the uterine tissue is friable.

J. P. GREENHILL.

**Auvray:** Curettage and Perforations of the Uterus, Bull. de la Soc. d'Obst. et de Gynéc. 2: 109, 1932.

Auvray believes that after an abortion the uterus should be emptied if there is a persistence of a bloody discharge or fever due to retention of pieces of placenta or membrane. He believes that for this purpose curettage is easier and much more aseptic than digital cure. Occasionally perforation of the uterus occurs during curettement. The author has observed four or five such cases, of which two represent personal experiences. He treated all the cases conservatively. In cases of perforation the curettement should be stopped immediately, ice applied to the abdomen and vaginal douches given. The patient should be kept absolutely quiet and closely observed for a few hours to see if surgical intervention becomes necessary. All of the author's patients recovered under this regime without any complications and without the aid of surgery.

The author mentions the risk of the doctor because of the legal question involved in operating upon a patient who is anesthetized when the perforation occurs. However, if a laparotomy becomes necessary the surgeon must proceed regardless of this. If intervention is necessary in clean cases the author favors laparotomy with suture of the edges of the perforation and retention of the uterus.

J. P. GREENHILL.

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## Original Communications

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### GRANULOSA CELL TUMORS OF THE OVARY\*

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California Medical School)*

THE granulosa cell tumor of the ovary is a comparatively rare tumor, but one which presents a number of features of the greatest interest, because the variety of its histologic appearances may make its recognition difficult. Likewise, it is of very great interest from the physiologic and clinical viewpoint, because there is definite evidence to show that this tumor elaborates the ovarian hormone, and upon this fact depend many of its clinical manifestations. Finally, from the standpoint of prognosis, it is a comparatively benign tumor and its recognition justifies simple extirpation when it occurs in young women. Since the historical aspect has been so well reviewed by Te Linde, and others, we shall omit discussion of this phase of the subject.

The frequency of this tumor is impossible to estimate accurately, because the earlier classification was in such confusion, and because a number of the more interesting cases have appeared several times in the literature in discussions by various authorities. The largest single series is that observed in the laboratory of Robert Meyer, who reported 33 cases in 1931. Many of these, however, came to him from outside sources. Plate states that there have been about 150 cases, but does not enumerate.

We have found four cases among 43 ovarian carcinomas occurring in 7500 gynecologic cases over a period of nineteen years and two

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other specimens have been brought to the laboratory from outside sources. Four of these were originally diagnosed as medullary carcinoma by competent pathologists. That the error is not an uncommon one is indicated by the fact that the microscopic illustrations of "medullary carcinoma" or "solid carcinoma" in almost any of the standard texts discussing gynecologic pathology may be taken as fairly typical examples usually of the cylindroid type of the granulosa cell tumor. The pathologic diagnosis, however, is not a particularly difficult one if one considers carefully the criteria established by Robert Meyer, although in some cases one must study sections from several areas.

These tumors are usually unilateral and the majority are comparatively small in size, varying from the almost microscopic ones discovered accidentally to about the size of a man's head. Rarely they attain larger size, as in the case of Dworzak, which weighed 3.5 kilograms, and the very exceptional case of Te Linde which measured 30 cm. in diameter and weighed 9.2 kilograms. Occasionally they are associated with fibromas, papillary cysts, or teratomas.

The tumors, as a general rule, are very well encapsulated with a thick, fibrous capsule. On cut section, there appear macroscopic cysts the size of a pea, rarely up to the size of a hen's egg, containing fluid. In some this is described as clear and straw colored, in others as greenish and turbid. The greater part of the tumor is usually solid, moderately firm, sometimes very friable. Some show considerable vascularity. The tumors with predominantly folliculoid structure are striking even macroscopically. In the firm connective tissue, there are numerous friable submiliary to pea-sized areas of which particularly the larger ones stand out because of their completely circular outline.

The microscopic structure is exceedingly varied and has been described most exhaustively by Robert Meyer. In certain of his tumors, he has found these varied pictures all present in different areas of one and the same growth, with transition forms between them, and has thus been able to prove the genetic relationship between seemingly very dissimilar forms. He describes three main types, the folliculoid, the cylindromatoid, and the diffuse or sarcomatoid. The most easily recognizable type and the one in which the morphologic resemblance to the normal granulosa cell is most striking is the folliculoid. It is also the rarest. The cells are small, very uniform in size and shape, and very similar to the granulosa cell of the normal follicle. They have a tendency to form structures somewhat resembling a normal follicle, although Meyer cannot agree with v. Kahliden about the extremely great similarity to normal follicles, even in v. Kahliden's own case. Ova are never found, but the tumor cells have a peculiar

tendency to arrange themselves regularly about drops of secretion or degenerating cells and become cut off into follicle-like spherical structures. Some of these groups form cysts of various sizes, of which several may run together in irregular form. The follicle-like structures may be grouped together to form large, almost entirely epithelial masses, with very little stroma, which may show much hyaline degeneration, or they may be widely separated by large masses of connective tissue. In certain cases, there is a tendency for the connective tissue to form a sort of theca about the follicular structures, although Meyer attaches less importance to this than does v. Werdt.

The cylindromatoid tumors are far more common but are much more difficult to recognize. They are frequently diagnosed as "medullary carcinoma" or "solid carcinoma" or even as endothelioma or sarcoma. In these, the small folliculoid structures are almost entirely absent or appear only in a rudimentary form. There may be large undifferentiated epithelial cell masses in which vacuoles may be entirely lacking and the connective tissue shows no hyaline degeneration but remains relatively rich in cells. In other cases, the cell masses may be broken up into small alveoli and the greater the breaking up, the more irregular is the form and arrangement of the cells. Most characteristic of this type, however, is the finding often of very complicated patterns of epithelial strands resembling moiré silk. Thin cords of one or more layers of epithelial cells interlace in parallel or branching strands, curves, and whorls to form sometimes extremely bizarre but very characteristic patterns.

In a few cases, there may be a diffuse picture resembling a sarcoma. The epithelial cells lose their epithelial character and become rather hard to differentiate from the stroma cells which may show a sarcomatoid proliferation. Recently, Meyer has come to believe that many cases considered as ovarian sarcoma actually belong in this group and this view is also subscribed to by Kermauner. This may explain the formerly puzzling cases in which precocity and other manifestations of endocrine influence were ascribed to tumors of connective tissue origin. One case of Meyer's is interesting in this connection in which a recurrence following a granulosa cell tumor appeared almost entirely as a spindle cell sarcoma; only in very scattered areas was it still possible to recognize the epithelial character of certain cells.

The histogenesis of these tumors is not absolutely established, although there is a general tendency to agree with Meyer that they probably arise from unused rests of granulosa cells in the medullary portion of the ovary, and particularly from misplaced rests in various types of congenital anomaly.

The other pelvic organs show changes which are to be ascribed to the hormonal influence of the tumor, and these naturally are most striking when the tumors appear in postmenstrual life when the ova-

rian hormonal influences have ordinarily ceased. In the children, data concerning the state of the uterus, and particularly of the endometrium, are usually lacking but since all showed vaginal bleeding, it is probable that hyperplasia of the endometrium may have been present.

Pahl states that, in his case in a nine-year-old child, the uterus was not enlarged or congested in spite of marked sexual precocity. In old women, the large size of the uterus, that of a woman in active sexual life, was striking, and, in some cases, myomas of considerable size which ordinarily atrophy with the menopause were found. Meyer found an endometrial hyperplasia of the glandular-cystic type which is ascribed to excess of the follicular hormone in all of his cases in which the endometrium was available for study (19 of 33). Klawns found evidence of functional activity of the glands in a number of postmenopausal women by demonstrating glycogen in the cells, and also demonstrated lutein-like changes in the tumor cells by special staining methods. That lutein hormone may be produced by some of the tumors is also suggested by the development of an actual decidua in the uterus in rare cases, as that of Arnold, Körner and Mathias in a sixty-three-year-old woman, and that of Dworzak in a patient fifty-two years old. In certain cases, as those of Taussig, Te Linde, and R. Schröder, a carcinoma of the endometrium had developed, possibly on the basis of a preexisting hyperplasia. Adenomyoma of the uterus, and, more rarely, other pelvic endometriosis has been reported fairly frequently, and has been ascribed to hormonal influences from the tumor by Tietze, King, Klawns, and others. The tubes usually showed the microscopic picture of those of young women. The ovary of the opposite side was usually normal; in old women senile, in young women showing normal follicle development; although sometimes the normal processes were apparently inhibited by the hormonal influence of the growth. That no permanent damage was done is shown by the numerous histories in which a normal menstrual cycle was resumed almost immediately following the removal of the diseased ovary. The tumors were bilateral in 6.2 per cent of 80 cases collected by Klawns. When they were bilateral, both ovaries were usually considerably enlarged, an important point in the consideration of treatment. Apparently independent growths of the opposite ovary are occasionally recorded, as cystomas, dermoids, and endometriomas.

The clinical features of these tumors are quite as interesting as the pathologic ones, and aside from the mere mechanical results of their presence, are dependent very largely upon their endocrine influence. There is very definite evidence that the tumor elaborates the ovarian follicular hormone. The results of this ovarian activity are naturally most striking when the tumor occurs at an age when ovarian activity is ordinarily in abeyance, as before puberty or after the menopause.

The tumor may apparently occur at any age, but is relatively rare before puberty, and relatively common in old age. Of 80 cases which Klawns collected, 7, or 8.7 per cent, occurred before or in the beginning of puberty; and 34, or 42.5 per cent, after the menopause. Two cases occurred at five years, and 8 were between 70 and 80.

The children showed evidence of sexual precocity; development of the breasts, of axillary and pubic hair, and vaginal bleeding. In one of Meyer's cases, there was an actual secretion of colostrum. Pahl's

nine-year-old child had the size, appearance, and demeanor of an adolescent. In Rummeld's case, a five-year-old child showed bleeding and swelling of the breasts.

In old women, there is often a sort of rejuvenation with a feeling of renewed youth, as well as swelling of the breasts, occasional galactorrhea and vaginal bleeding, sometimes periodic, more often irregular. The uterus in these women attains the size of that of a woman in active sexual life and the endometrium shows hyperplastic changes. In one woman who had ceased menstruating only two years previously and who still suffered from extreme vasomotor symptoms, these disappeared with the development of the tumor. One of our own patients developed very distressing vasomotor symptoms after the removal of her tumor.

During active sexual life, the symptoms are naturally more difficult to evaluate. However, the presence of severe and long continued hemorrhages which do not yield to ordinary endocrine treatment should arouse suspicion, especially if an ovarian enlargement can be palpated, although sometimes severe symptoms may occur with extremely small tumors. One of Klasten's cases showed this picture, and Tietze's case had been curetted for bleeding almost yearly from the age of eighteen to thirty-three, and had had an Alexander suspension and cervical amputation without result. The endometrium always showed a marked hyperplasia. She finally refused further curettage and demanded active intervention, and a granulosa cell tumor of her left ovary, as well as an adenomyoma of the uterus was discovered at operation. In other cases, there may be an amenorrhea, or periods of amenorrhea alternating with profuse and prolonged bleeding. In certain cases, the presence of amenorrhea with a unilateral adnexal mass may bring up the differential diagnosis of ectopic pregnancy, as in one of our own cases, and occasionally the presence of breast changes may strengthen such a suspicion. It is probable that sterility may be dependent upon endocrine influences from the tumor. One of our patients had been sterile for five years but had a child without further treatment within two years after removal of the tumor.

Symptoms due to the actual presence of the tumor itself may occur at any age. Pain is a frequent symptom, and pressure symptoms may occur. Abdominal enlargement is relatively infrequent, since the tumors are usually small, but may be due to ascites, which is sometimes present. Torsion of the pedicle is not very frequent, but may give rise to acute symptoms as in one of our cases.

The patients are sometimes anemic, due to hemorrhage, but as a rule their general condition is good. Sedimentation time has been recorded only in recently reported cases, but varied from two to three and a half hours in four cases of Klasten. In three of our own cases, it varied from one to three hours.

Studies of these cases from the endocrine standpoint are just beginning to appear in the literature. Klasten found a basal metabolism of 18-plus and 24-plus respectively in two of his cases which returned to normal after the removal of the tumor. Schuschania's studies, although they were made upon one case only, are most significant. A woman of sixty-seven years, who had had the menopause at fifty-eight, had bled vaginally for two weeks. She had an enlarged uterus with a hyperplastic endometrium and a fist-sized granulosa cell tumor of the right ovary. Quantitative tests showed that she excreted large amounts of follicular hormone in both urine and stool preoperatively and for a few days after operation and that her Frank test was positive. Sixty-six days after operation no hormone could be demonstrated in either urine or stool. It seems extremely probable that the tests for follicular hormone will assume as great diagnostic and prognostic importance for granulosa cell tumor as does the Aschheim-Zondek reaction for hydatidiform mole and chorionepithelioma.

Implantation experiments were negative in Schuschania's case. Similar negative results with implantation experiments have been reported by Meyer, Kermauner, and Kaufmann, although Polano was able to demonstrate enlargement of the uterus of a mouse with the content of a "myxosarcoma" from a one-and-one-half-year-old child with precocious menstruation.

As might be expected the Aschheim-Zondek test is of little value in these cases, although occasionally a positive Reaction I has been reported. We performed the Aschheim-Zondek reaction on the eighteenth and twenty-third postoperative days, respectively, in two of our postmenopausal cases with negative results throughout.

The prognosis in these tumors is a matter of great interest. That they are relatively benign, there is no doubt, as is shown by the considerable number of cures following simple excision of the tumor. The long duration of symptoms and the large size they occasionally attain without extension beyond the capsule, as in Te Linde's 20-pound tumor which had given symptoms for four years, also speaks for benignity as well as the fact that spilling cyst contents during operation is not necessarily disastrous. Yet to arrive at an accurate estimate of the percentage of five-year cures is practically impossible, since unfortunately a large proportion of the cases have been described soon after the operation by pathologists, and there is no record of what happened to the patient. Further, the confusion in the earlier literature makes it impossible to be certain which cases one should actually include in the group.

Of Meyer's series of 33 cases, one woman died postoperatively and only three from later metastases. As far as he could ascertain, 19 had remained permanently cured after operation, most of them for more than one year, others for more than four years. In Te Linde's compilation of 33 cases, only 17 of which were followed,

13 of the cases were reported as well from one to eleven years after operation. Only four of the series had been followed until death; of these, one was an immediate postoperative death, and three had died within six months after operation with definite recurrences. Lepper, Baker and Vaux have recently reported 7 cases, of which 6 have remained well for from four to fifteen years after operation, and one for eleven months.

Klaften was able to collect 80 cases which gave enough clinical data to form a prognostic estimate. These included the 33 cases of Robert Meyer, 10 of his own, 6 of Neumann and smaller series of various authors. He found that in 5, or 6.2 per cent, the tumors were bilateral. When they were bilateral, both tumors were usually large. In 4 cases, or 5 per cent, there were recurrences or metastases. In 6 cases, or 7.5 per cent, the tumors were described as inoperable. This is in considerable contrast to the less than 10 per cent curability of ovarian carcinoma in general.

Even recurrences have not the absolutely hopeless prognosis usually associated with them, as is indicated by the ten-year cure of Rummeld's child after her second operation. This five-year-old girl had bilateral tumors, but as part of one ovary looked normal, this ovary was resected instead of performing a radical operation in view of her extreme youth. Her symptoms disappeared but three years later recurred, and it was found that a tumor had developed in the remaining portion of the ovary. This was removed and she had remained well without further symptoms ten years later.

The question of the radiosensitivity of these tumors is important for the cases in which complete removal is not possible and for old women who are poor operative risks. They should be amenable in view of the marked sensitiveness of normal granulosa cells to radiation, as has been pointed out by Schiffmann, Dworzak and Habbe, but as yet there are no clinical observations of sufficiently long standing to be of value. Dworzak's fifty-two-year-old patient who had a 3½ kg. tumor was entirely well one and three-quarters years after removal of the tube and ovary only followed by a course of x-ray therapy, yet a similar result has often been obtained without radiation. One of our own patients is well one year after complete removal of her pelvic organs, plus a course of x-ray treatments, far too soon to come to any definite conclusions. The same criticism applies to Habbe's case of a seventy-three-year-old woman whose tumor could not be completely removed. It disappeared under x-ray treatment and the uterus decreased to the normal senile size. In Schiffmann's second case, however, in which postoperative x-ray treatment followed an incomplete removal, the tumor continued to grow rapidly.

A review of our own cases follows.

CASE 1.—E. S. G., aged fifty-four, complained of vaginal hemorrhages for two years, spotting for one year and blood-streaked stools. Her mother, living at eighty, had had her menopause at fifty-five, and had been cured of "cancer of the hand" at seventy. Patient has had five children and two miscarriages. Her menses began at fifteen and were irregular at the onset. Since then they occurred every twenty-eight to thirty days and lasted five days, with a moderate flow until her



present illness. Four years previous to admission, the periods became more profuse and gradually more prolonged with large clots until they lasted two weeks and weakened her greatly. For two years the regularity of her periods was maintained, then she had a six months' period of amenorrhea, and since then, the hemorrhages had been irregular and less severe with spotting between them. She had had a dragging sensation in the pelvis and pressure on the bladder and rectum. For a few weeks the stools had been blood streaked.

Her physical examination was negative, except for her pelvic findings and the presence of hemorrhoids. The outlet was relaxed, the cervix large with patulous os, the uterus enlarged and retroverted, the adnexa not palpable. Blood count within normal limits, sedimentation time two hours plus. Urine negative. A panhysterectomy and bilateral salpingo-oophorectomy were performed on Oct. 26, 1931. Her postoperative course was uneventful except for an unexplained low grade fever for twenty-three days. On the twenty-third postoperative day, an Aschheim-Zondek



Fig. 1.—Hyperplastic endometrium of Case 1.



Fig. 2.—Folliculoid type of growth in Case 1. Note encapsulation.

reaction on the urine was negative. An x-ray of the skull showed the sella well outlined and of normal size. Her pelvic examination on discharge was negative and she has remained well for a year, her only complaint being due to extremely severe menopausal symptoms which showed some improvement under endocrine therapy.

The pathologic examination gave the following findings: The uterus was enlarged to the size of a two and a half months' pregnancy and had a thick fibrous wall. There was a marked glandular cystic hyperplasia of the endometrium (Fig. 1) with a large mucous polyp. The cervix was markedly hypertrophied. The tubes were normal with no evidence of senile change. The ovaries were small, wrinkled, grossly atrophic organs of a yellowish white color. There was no evidence of activity on superficial examination. On section, the left ovary contained a few small white bodies and one larger collection of circumscribed cellular areas in one large capsule measuring 1.5 cm. in diameter and occupying one pole of the ovary. This tissue was slightly yellow in color, appeared highly cellular and was traversed by many fibrous septa so that it appeared lobulated. On microscopic examination, the right ovary showed only a fibrous stroma with a few corpora albicantia. The left ovary showed

a very cellular picture. Practically the entire section was composed of circumscribed nodular collections of cells which were separated by fibrous trabeculae and which bore much resemblance to normal granulosa cells (Fig. 2). They showed a remarkable uniformity in size, shape, and staining qualities, were small and rounded with comparatively large nuclei. There were occasional mitoses (Fig. 3). There was a considerable tendency for the cells to group themselves radially about small cystic spaces containing cellular debris, thus giving rise to structures somewhat resembling primordial follicles, with occasional larger cysts lined by several layers of the granulosa-like cells. There was very little connective tissue stroma, but a considerable number of twisted hyaline strands which resembled corpora albicantia.

CASE 2.—E. T., aged fifty-four, had had a long and eventful gynecologic history. She first entered the University of California Hospital in April, 1921, aged forty-three, complaining of irregular menses. Her family history was negative. She had had practically all the exanthemas. She had had a hemorrhoidectomy at the age of thirty-seven and a cervical polyp had been removed at the age of forty-one. She had had three children with easy normal labors and one early spontaneous miscarriage. Her menses began at twelve years and were irregular, occurring about every six



Fig. 3.—Folliculoid type, Case 1. Note hyaline bodies resembling corpora albicantia.

weeks, lasting three to four days, and were scanty. For five years they were more frequent and more profuse until the polyp had been removed. Since then they had been normal until the past two months when she had flowed profusely for two to three weeks. For several years, she had had an ache or dull pain in the left lower quadrant, worse during her periods, and had also had frequent fainting spells. She was under a physician's care for her heart.

Her physical examination at this time was negative except for a systolic apical murmur and the pelvic findings. She was slightly anemic. The cervix was large, the uterus was enlarged, hard, retroverted, and movable. The left ovary was the size of an English walnut. She was curetted and 596 mc. hours of radium were given in the uterine cavity. The endometrium was thickened but no polyps were found.

The second entry was in June, 1927. Following the radium six years previously her periods had been normal until December 26 when she missed her regular period. She started to flow on January 21 and had flowed moderately but continuously since. One week before admission she had bled so profusely that packing was necessary. Her examination was practically the same as on previous entry, except that she had a mild hypertension, blood pressure 160/90. The sedimentation time was three hours.

The uterus was large, the sound entering  $3\frac{1}{4}$  inches, the cervix was hard and corrugated with nabothian follicles and a small polyp. There was considerable descent. She was curetted, the cervix was resected and 1214 mc. hours of radium were inserted. The pathologic examination showed a chronic endocervicitis with nabothian follicle cysts, a benign cervical polyp and hyperplasia of the endometrium.

The third admission was on Dec. 21, 1931. She had been fairly well since the last operation. Her periods were very irregular, she often missed months completely; for almost a year she had daily slight spotting. Her examination was practically the same as on the previous admission. On December 23, a dilatation and curettage, posterior colporrhaphy, supravaginal hysterectomy and bilateral salpingo-oophorectomy were performed.

Her postoperative course was uneventful. An Aschheim-Zondek reaction on January 11 was negative. She has been very well for eleven months but has had some menopausal symptoms.

Pathologic examination gave the following findings: The uterus was the size of that of a woman in active menstrual life. The endometrium was markedly hyperplastic. The tubes were normal, showing no evidence of senile changes. The left



Fig. 4.—Cylindromatoid picture in Case 2. Note moiré silk pattern of epithelial strands.

ovary showed only a dense fibrous stroma containing a few corpora albicantia. There was no evidence of activity. The right ovary measured 4 by  $1\frac{1}{2}$  by  $1\frac{1}{2}$  cm., was swollen in its central portion and had a shiny yellowish surface. On section, there was a thick white capsule while the swollen central area was filled with a sharply demarcated yellowish growth with a hemorrhagic center, which, on casual inspection, might easily have been considered a corpus luteum. Sections showed also a dense fibrous stroma. The growth was very cellular, the cells showed much resemblance to normal granulosa cells. In some areas, there was a slight tendency to grouping about very small cystic spaces, giving somewhat the picture of a primordial follicle, but most of the section showed the bizarre moiré silk pattern of the cylindromatoid type of growth (Fig. 4).

The long gynecologic history is of interest in this case and, in view of the slight ovarian enlargement on her first admission, it is interesting to speculate whether this small tumor may not have been present over many years, yet have been inhibited in its manifestations by the radiation therapy.

CASE 3.—A. P. C., a widow of forty-seven, complained of abdominal pain and vaginal bleeding. Her family history was positive for carcinoma on both sides of the family and for tuberculosis on the maternal side. Her past history was irrelevant.

She had had one child, a normal pregnancy and labor, no miscarriages. Her menses began at fifteen and were regular, lasting 4 to 5 days. Bleeding was profuse with clots but no pain. For a time, she bled ten days of every twenty-one, then resumed the former rhythm. At the age of thirty-eight her menses ceased abruptly at the death of her child. At 43½ she again began to flow, rather irregularly but periodically, the periods lasting about four days and being very profuse. One year previously and again shortly before admission she had bled continuously for a month. She had had lumbar backache for several years and a sense of bladder pressure for some months. One month prior to entry, she had an attack of severe cramping lower abdominal pain with nausea, vomiting, and weakness, and was in bed for two weeks with occasional chills, vomiting, and fever. A physician had diagnosed uterine fibroids.

Physical examination showed a small, thin woman with a moderate anemia, a mitral heart disease with stenosis and insufficiency, a mild hypertension, an umbilical hernia, and a large firm pelvic tumor. Her sedimentation time was one hour.



Fig. 5.—Cylindromatoid area from Case 3.



Fig. 6.—Folliculoid area from Case 3.

At operation on Nov. 19, 1931, a panhysterectomy and bilateral salpingo-oophorectomy were performed, removing a large left ovarian tumor with twisted pedicle.

Her postoperative course was uneventful except that because of the pathologic diagnosis of medullary carcinoma, she was given a course of x-ray treatments which caused considerable reaction. She remained well until a year later.

Pathologic examination showed a considerably enlarged uterus, about the size of a two months' pregnancy, with a small subserous myoma. There was a hyperplastic polypoid endometrium. The tubes were those of a young woman. The right ovary was senile. The left ovary formed a large, flat, ovoid mass measuring 13 by 10 by 5 cm. and weighing 400 gm. The surface was smooth and shiny, and through it several small yellow areas and cystic follicles could be seen. On cut section the tumor was, in general, firm, white and fibrous in appearance. There were a number of yellow areas somewhat suggesting corpora lutea, and a few cysts filled with a dark gelatinous content. The tissue seemed well vascularized.

Microscopic section showed a rather varying picture. The stroma was quite firm and fibrous in some areas, in others edematous and even myxomatoid. This stroma

was invaded in masses, strands and singly, by tumor cells which were small and of somewhat varying shape. In the larger masses, they bore considerable resemblance to granulosa cells, with occasionally a moiré pattern (Fig. 5). Most of the cystic spaces were rather irregular, but the cells lining them also resembled granulosa cells, and occasionally showed a radial arrangement about very small cystic spaces (Fig. 6). In other areas, there was a very diffuse, sarcomatoid pattern (Fig. 7). There were many mitoses. A diagnosis of medullary carcinoma was made, but later review of the case and careful study of many sections convinced us that it is really a granulosa cell tumor. The clinical history and the large uterus with hyperplastic endometrium are confirmatory.

It is interesting that this patient, since her operation a year ago, has undergone a change in personality so striking that it is the subject of much comment among her nonmedical associates. She was formerly shy, almost asocial, rarely speaking to any one, and has suddenly become gay, friendly and very social in her tendencies. One should really expect the opposite change.

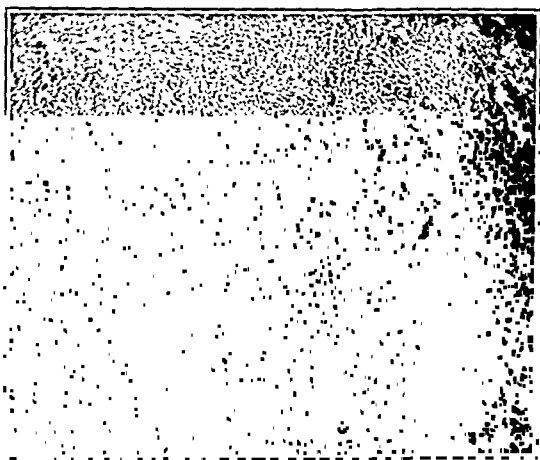


Fig. 5.—Cylindromatoid area from Case 3.

CASE 4.—A. S., aged twenty-seven, complained of right-sided pelvic pain. Family history negative. Past history irrelevant. Menses began at thirteen, were regular, and very profuse until two years before admission. At this time, she had a fall and was "paralyzed" for several days. Since then, her periods were very irregular and scanty, every one to two months, lasting one day. The last period was three months previously. She had been married five years and had had no children, although she desired them. An excellent gynecologist consulted six months previously because of the sterility had told her the pelvis was perfectly normal. For four months she had had rheumatic pains all over her body which had been very severe for two weeks. In the course of a general examination, it was found that she had a left-sided adnexal mass. In view of her amenorrhea, the question of ectopic pregnancy came up although an ovarian cyst was considered more likely. A few hours after the examination, she had much pain in the side and a slight soreness had persisted for a week.

Examination showed an obese young woman with normal hair distribution. Her general physical examination was negative except for infected tonsils and a tooth abscess which showed on x-ray examination. Her pelvic examination was negative except for the left-sided adnexal mass.

On Jan. 29, 1918, a dilatation, curettage, a left salpingo-oophorectomy, appendectomy and tonsillectomy were performed. The uterus was infantile in type, measuring  $2\frac{3}{4}$  inches by sound, and there was practically no endometrium present. The left ovary was 5 cm. in diameter and contained a large blood cyst which was at first considered a corpus luteum cyst. During the operation, the cyst ruptured on one surface and the contents started to extrude, and it was found that in addition to the blood clot, there was some tissue which seemed to resemble infarcted placenta and it was thought that we might be dealing with an ovarian pregnancy. On microscopic examination, however, it was found that the tumor content consisted of an almost entirely epithelial mass of small, regular, remarkably uniform cells with practically no supporting stroma, although it contained a considerable number of quite large blood vessels (Fig. 8). There was a tendency to hyaline degeneration in the stroma which was present. There was a considerable number of mitoses, and a diagnosis of medullary carcinoma was made.

However, in view of the patient's youth and great desire for offspring, it was decided to do nothing further, but keep her under extremely close observation. Her

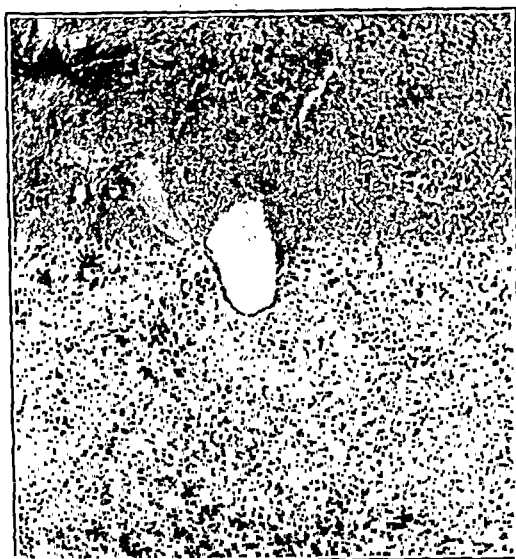


Fig. 8.



Fig. 9.

Fig. 8.—Solid masses of small granulosa cell-like cells from Case 4.

Fig. 9.—Broad bands of granulosa-like cells with some tendency to folliculoid arrangement. Case 5.

convalescence was uneventful. She has remained entirely well for fifteen years and has had one child, a boy, born about two years after the operation. She has become even more obese since this time but there is probably a large dietary factor.

Later review of her tissue allows us to classify it as a granulosa cell tumor, as the cells resemble normal granulosa cells very markedly. In areas, there is a very typical moiré silk picture, and further sections have even shown a very slight tendency to folliculoid structure in certain areas. Why this patient did not exhibit the characteristic uterine enlargement remains a question, and unfortunately, her endometrium did not reach the laboratory.

In Case 5, specimen of which was sent to the laboratory for diagnosis from an outside source eleven years ago, clinical data are unfortunately lacking, except that she died of recurrence about four years postoperatively.

The tumor consisted of a large cystic mass, which had been opened and had collapsed, but had apparently measured about 15 cm. in diameter. The outer surface was smooth, the wall varied from 2 to 4 cm. in thickness and presented

an extremely irregular inner surface. On cut section, it seemed extremely cellular and friable, and was intermingled with much hemorrhage. The uterus was two times normal size with a hyperplastic endometrium, the tubes normal, the opposite ovary small and inactive. Sections of the tumor showed broad bands of epithelial cells separated by connective tissue stroma (Fig. 9). The cells were small, very uniform in size, shape and staining quality, with comparatively large nuclei, and showed a tendency to arrange themselves perpendicularly to the connective tissue. In certain areas, they surrounded cystic spaces forming structures resembling follicle cysts. There were many mitoses and the original diagnosis was that of a rapidly growing medullary carcinoma. Later review of the material makes it seem certain that we are dealing with a granulosa cell tumor.

Case 6 was a very small tumor measuring only about 2 cm. in diameter which was brought to the laboratory by an outside pathologist who was puzzled by its appearance. Clinical data are incomplete but it was considered an incidental finding in an operation for fibromyomas in a postmenopausal woman who had begun to bleed periodically and had not responded to x-ray therapy. It is probable that the ovarian tumor was of far greater importance in this clinical picture than its small size would indicate, for it was a typical granulosa cell tumor, with a largely cylindromatoid structure, but showing a folliculoid arrangement in smaller cell groups about the edge of the main epithelial mass. This is a recent case also, and its outcome will have to be reported later.

We realize fully that all except two of our cases are open to the same criticism that we have made of so many in the literature, that they are reported too soon to know the final outcome. However, the subject seems of such great interest at the present time that we present them in spite of this objection, and hope to report their ultimate prognosis at some future date.

#### CONCLUSIONS

Granulosa cell tumors of the ovary are not so rare as was formerly supposed.

They are frequently mistaken for medullary carcinoma, or even for sarcoma or endothelioma by those not familiar with their characteristics. The pathologic diagnosis is not, however, particularly difficult if these characteristics are kept in mind.

There are three main histologic types, the folliculoid, the cylindromatoid, and the sarcomatoid. Frequently, two or all three of these types are found in different areas of the same growth.

The clinical diagnosis may be easy before puberty, or after the menopause, but is difficult during active sexual life. A careful study of the patient from the endocrine standpoint will prove of great aid in the preoperative diagnosis of these cases, as well as in postoperative prognosis. There is definite evidence that these tumors elaborate the ovarian follicular hormone, and possibly, in some cases, the lutein hormone also. It is probable that the follicular hormone tests will become as important for these cases as is the Aschheim-Zondek for chorionepithelioma.

These tumors are usually unilateral and comparatively benign, and simple excision of the tumor is ordinarily curative. It is, therefore, most important to make a preoperative or at least an operative diagnosis, as this allows of conservatism in the case of young women. In women past the menopause, complete removal of the pelvic organs is preferable if the patient is a good risk. In the rare cases where complete removal of the tumor is not possible, postoperative radiotherapy will probably increase the chances for cure.

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NOTE: Since presenting this paper, there has been one further case in the University of California gynecologic service which may be included in this category. This was a nine-pound, right-sided, multilocular cyst containing large solid areas, occurring in a fifty-one-year-old woman whose menses, regular until forty-five, had since been very irregular and prolonged with occasional intermenstrual spotting. At forty-six years of age, a cyst had been resected from the right ovary. The remainder of the ovary and the left one were considered normal. The nature of this cyst is unknown.

Pathologic examination showed an enlarged uterus with a hyperplastic endometrium. The ovarian tumor showed many areas of typical cylindromatoid structure, and other sarcomatoid areas, but a folliculoid arrangement was almost entirely absent. The opposite ovary was normal. The uterus, both tubes, and ovaries were removed, and a course of deep x-ray therapy was given. A Frank test one month postoperative was negative. She is well two months later.

#### REFERENCES

- (1) *v. Kahlden*: *Centralbl. f. Allg. Path. u. Anat.* 6: 257, 1895. (2) *Gottschalk*: *Berl. Klin. Wehnschr.* 39: 607, 1902. (3) *Brenner*: *Frankf. Ztschr. f. Path.* 1: 150, 1907. (4) *Sternberg*: *Halban-Seitz-Biologie & Path. des Weibes* 5: 751, 1926. (5) *Meyer, R.*: *Arch. f. Gynäk.* 148: 541, 1932. (6) *Te Linde*: *AM. J. OBST. & GYNEC.* 22: 552, 1930. (7) *Robinson*: *AM. J. OBST. & GYNEC.* 5: 581, 1923. (8) *King*: *Surg. Gynec. Obst.* 49: 433, 1929. (9) *Meyer, R.*: *AM. J. OBST. & GYNEC.* 22: 697, 1931. (10) *Taussig*: *Am. J. Cancer* 15: 1547, 1931. (11) *Habbe*: *Zentralbl. f. Gynäk.* 55: 1088, 1931. (12) *Plate*: *Arch. f. Gynäk.* 151: 26, 1932. (13) *Meyer, R.*: *Arch. f. Gynäk.* 109: 212, 1918. (14) *Dworzak*: *Zentralbl. f. Gynäk.* 56: 1033, 1932. (15) *Neumann*: *Arch. f. Gynäk.* 121: 69, 1923. (16) *Frankl*: *Zentralbl. f. Gynäk.* 55: 21, 1932. (17) *v. Werdt*: *Beitr. z. Path. Anat.* 59: 453, 1914. (18) *Rummeld*: *Zentralbl. f. Gynäk.* 55: 292, 1931. (19) *Kermauner*: *Veit-Stoeckel-Handbuch f. Gynäk.* 7: 331, 1932. (20) *Pahl*: *Arch. f. Gynäk.* 147: 736, 1931. (21) *Klaften*: *Monatsch. f. Geburtsh. u. Gynäk.* 86: 392, 1930. (22) *Arnold-Körner-Mathias*: *Virchow's Arch.* 277: 48, 1930. (23) *Schröder*: *Arch. f. Gynäk.* 4: 193, 1901. (24) *Tietze*: *Ztschr. f. Geburtsh. u. Gynäk.* 91: 111, 1927. (25) *Klaften*: *Arch. f. Gynäk.* 150: 643, 1932. (26) *Schuschania*: *Zentralbl. f. Gynäk.* 54: 1924, 1930. (27) *Kaufmann*: *Ztschr. f. Geburtsh. u. Gynäk.* 91: 672, 1927. (28) *Polano*: *Arch. f. Gynäk.* 120: 308, 1923. (29) *Meyer*: *Zentralbl. f. Gynäk.* 49: 1662, 1925. (30) *Lepper, Baker, and De Faus*: *Proc. Royal Soc. Med.* 25: 12414, 1932. (31) *Aschheim and Zondek*: *Klin. Wehnschr.* 9: 679, 1930.



## THE PROBLEM OF IRREGULAR MENSTRUATION\*

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THE occurrence of menstrual irregularities has long been held an important symptom in the study of gynecologic disease. This conception was based on the assumption that the menses occur at regularly stated intervals in the great majority of individuals, and that any deviation from this standard is evidence of a pathologic condition. There is, however, good reason to doubt the traditional belief that menstruation does occur regularly, and from this standpoint it is necessary to inquire further into the circumstances under which irregularities are of significance as a symptom of disease.

The standard textbooks demonstrate a very general agreement on this fundamental question. It is stated that approximately 70 per cent of all patients have regular menstruation of twenty-eight or thirty days' duration, and that the balance present either shortened or lengthened cycles. It is also claimed that patients may be grouped into specific categories according to the length of the intervals, such as twenty-eight-day types, twenty-one-day types, thirty-day types, while it has been advanced that the total length of cycles in days is usually some multiple of seven, such as 28, 14, 35, etc. A recent textbook of obstetrics even makes the statement that not only do the majority of women menstruate every twenty-eight days, but during the time of the new moon.

These assertions are invariably based on statistical studies made of the statements of patients, the majority of whom undoubtedly make no effort to keep accurate records of their menstrual periods. From the standpoint of scientific accuracy these histories are of no value, and unfortunately there have been but few attempts to study the question by means of carefully planned records. Three such studies have been reported, one by Foster<sup>1</sup> in 1889, one by King<sup>2</sup> in 1926, and one by Geist<sup>3</sup> in 1930, and in each case it was clearly demonstrated that menstrual cycles not only in different individuals but in the same individual, vary tremendously in their duration. It would seem, however, that traditional beliefs and lunar superstitions have had a stronger hold on the profession than these valuable scientific contributions.

The problem is one of such fundamental importance that an extensive investigation to determine the length of successive menstrual

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cycles in a group of healthy young women was recently conducted with the assistance of Dr. Ethel D. Owen and the cooperation of the Stanford School of Nursing (Fluhmann<sup>4</sup>). A large group of nurses were given small calendars on which the dates of their menses were recorded, and from this the cycles were estimated as periods extending from the first day of a menstrual flow to the next. Every precaution was taken to eliminate any possible pathologic state or abnormal condition due to life in an institution, and finally 76 records were accepted as the basis for this analysis. Each individual was observed for periods varying from six to thirteen months, and a total of 747 cycles was available for study.

An analysis of the 747 cycles shows very clearly the great variability in their length. The range is from 11 to over 144 days, although 97 per cent of instances were grouped between eighteen and forty-two days. The most frequent cycle was of twenty-nine days with 73 cases, while the mean was of 30.4 days.

A study of the individual cases is still more impressive as regards the great variability in the lengths of successive cycles. No instance of absolute regularity was noted. However, by giving a very loose interpretation to the term "regular" and considering as such the cases where all but one or two cycles fell within a five-day period, 28, or one-third, could be placed in this category. Of these, only 9 had cycles which fell within twenty-six to thirty days, while in 6 there was a tendency for the cycles to be shorter, and in 13 to be of longer duration.

In 48, or two-thirds, of the cases the cycles were very irregular. Although in 16 the menses were considered as of the "irregular delayed" type, it is noteworthy that only 4 fell in the "irregular too frequent" group. On the other hand, the largest group of the series, 28 cases, showed a tremendous variability in the lengths of the cycles, some at times being very short (for example, eleven days) and others very long (for example, seventy-eight days).

However revolutionary these results may seem to be, they are in keeping both with those of Foster and of King, and likewise with those of a third unpublished study conducted in Baltimore, Md., by Dr. Josephine Ball (Hartman<sup>5</sup>). It would seem that our future interpretation of menstrual irregularities must be approached with the conception that such irregularities are more frequent in normal individuals than so-called regular cycles.

#### POLYMENORRHEA

The least frequent type of menstrual cycle noted in the Stanford investigation was that of shortened duration, since there were only 6 (7.8 per cent) in the "regular too frequent" and 4 (5.2 per cent) in the "irregular too frequent" group. This is of interest not only because this irregularity is of considerable importance as a symptom of disease, but also because these figures correspond closely to a number of other statistics on normal menstruation which were based on patients' statements. It seems quite logical that a woman

who menstruates at intervals of two or three weeks would much more readily have her attention directed to this phenomenon than one in whom the periods are further apart.

In a previous communication (Fluhmann<sup>6</sup>) the mechanism by which polymenorrhea as an abnormal condition may be brought about, was discussed. It was pointed out, in the first place, that the patients may have a hyperplasia of the endometrium, a condition characterized by a failure of ovulation with consequent lack of corpus luteum formation and an excessive production of the ovarian follicular hormone ("hyperestrinism"). In 8 out of 75 patients with this condition cyclical bleeding was noted at intervals shorter than four weeks (Fluhmann<sup>7</sup>). The second possibility, which was advanced by Schroeder,<sup>8</sup> is that the menstrual cycle is shortened because of an injury or inherent weakness of the ovary so that there is a premature disintegration of the corpus luteum with a resultant early appearance of menstruation. This is apparently the explanation for the occurrence of too frequent menses in patients with pelvic inflammatory disease (Fluhmann<sup>9</sup>). The third possibility is based on the assumption that there is a speeding up of all the events of the menstrual cycle, and it was intimated that this may be due to a primary overactivity of the anterior hypophysis. A fourth theoretical possibility may be advanced although it represents an unusual condition, namely, that some women may have a slight flow at the time of ovulation such as occurs in certain animals. There thus appears frequent cyclical bleeding but only every second period can be considered as true menstruation.

In an analysis of abnormal uterine hemorrhage in 507 gynecologic patients (Fluhmann and Morse<sup>10</sup>) it was observed that this bleeding was cyclical and occurred at intervals shorter than four weeks in 59 cases. In all but 9 of these, an organic lesion such as pelvic inflammatory disease, fibromyoma uteri, or hyperplasia of the endometrium, was present, and in 34 of the 59 profuse periods were complained of in addition to the frequency of occurrence. It has seemed important, therefore, to review these histories and analyze this symptom in more detail. It was then found that in only 8 instances had the menses been too frequent since their onset at puberty and no recent change had been observed. In 4 cases the menses had always been frequent, but some additional abnormality, such as a more profuse flow or shortening of the cycle, had supervened, while in 5 cases this information could not be obtained from the history. On the other hand, the shortening of the cycle in 42 of the 59 cases was a symptom which had appeared secondarily a few months or years before the patient reported for treatment.

It would seem, therefore, that polymenorrhea must still be considered as an important symptom directing attention to pelvic disease. It is, however, of the utmost consequence to remember that it only has

full significance when it appears as a change from a previous rhythm or when it is accompanied by an increase in the amount of blood loss. The occurrence of menses at more frequent intervals than four weeks, especially when persisting from the time of puberty, may be an essentially normal phenomenon, and when unassociated with demonstrable pelvic disease or harmful blood loss, is not per se an indication for treatment.

#### DELAYED MENSES

The significance of irregular delayed menses becomes still more difficult to interpret when the fact that two-thirds of normal women have prolonged cycles is taken into consideration. This symptom has been held an important indication of diminished ovarian activity and as a prominent factor in sterility, but it would seem that considerable doubt must be attached to statistics which are advanced to prove this contention since accurate figures for control series were not employed.

The occurrence of irregular delayed menses is not incompatible with normal health, and the majority of these women not only have large families but do not necessarily develop more serious conditions subsequently. A review of the last 15 cases of irregular delayed menses in married women reporting for investigation shows that 9 had always had long menstrual cycles and of these 7 had borne full-term children. The two who had never become pregnant were young women of twenty-two and twenty-three respectively, so that they could hardly as yet be considered sterile. An analysis of the histories of 18 women with prolonged periods of amenorrhea, which must be considered as a serious complication, presents some interesting information on the relation of irregular delayed menses to this condition. In 10 of the patients there had always been irregular delayed menses, in 7 they had been considered as regular, while in one they were stated as being at first regular and later irregular. There is such a slight difference in the two groups, and in the normal series irregular delayed menses occurred so much more frequently than so-called regular, that one is inclined to believe that the existence of irregular delayed menses alone is not an important precursor of cessation of ovarian function.

On the other hand, the occurrence of irregular delayed menses is undoubtedly associated with other features which indicate an abnormal condition. One of the most frequent concomitant symptoms is that of scanty flow, and it would seem that this is a very important feature. In the Stanford series, 823 menstrual periods were analyzed and it was found that under normal conditions the average duration of the hemorrhage is 4.6 days, while in the vast majority of instances it varies from three to seven days. It also seemed definite that the length of the menstrual cycle in normal individuals has no influence on the duration of the flow which remains a much more constant fac-

tor. The occurrence of any marked change in the length of the menstrual periods or in the amount of blood loss is apparently a more significant finding indicating an abnormal condition than any irregularity in the length of the cycles.

Among other important findings which may be associated with irregular delayed menses in addition to scantiness of the flow, are obesity, hypertrichosis, vasomotor disturbances and diminished basal metabolic rate. It cannot be denied that these patients form an important endocrinologic group which is sorely in need of careful investigation and the development of adequate treatment. The finding of irregular delayed menses in such patients, however, may not be as significant as it has been maintained, since all the associated symptoms mentioned above may be present in women who claim that their periods occur regularly every month. It would seem that a progressive condition where the cycles become successively longer and the flow gradually less, is a much more significant sign than the mere fact that the patient's menses have been irregularly delayed since puberty.

#### SUMMARY

Recent investigation suggests that the length of successive menstrual cycles in normal women is characterized by a marked irregularity in at least two-thirds of instances.

The occurrence of irregular menstrual cycles in the absence of demonstrable pelvic disease should not be considered as an abnormal finding requiring treatment, unless (1) it represents a change from a previously established rhythm, (2) it is accompanied by a marked increase or decrease in blood loss, or (3) it is associated with concomitant symptoms pointing to an endocrinologic disturbance.

#### REFERENCES

- (1) *Foster, E. F.*: N. Y. Med. J. 49: 610, 1889.
- (2) *King, J. L.*: Cont. to Embryol. 18: 79, 1926.
- (3) *Geist, S. H.*: AM. J. OBST. & GYN. 20: 320, 1930.
- (4) *Fluhmann, C. F.*: To be published.
- (5) *Hartman, C. G.*: Personal communication.
- (6) *Fluhmann, C. F.*: Endocrinology 15: 177, 1931.
- (7) *Idem*: Surg. Gynec. Obst. 52: 1051, 1931.
- (8) *Schroeder, R.*: Der mensuelle Genitalzyklus des Weibes und seine Störungen, in Veit-Stoeckel: Handbuch der Gynaekologie, Munich, J. F. Bergmann 1: part 2, 1928.
- (9) *Fluhmann, C. F.*: J. A. M. A. 97: 694, 1931.
- (10) *Fluhmann, C. F., and Morse, D. L.*: AM. J. OBST. & GYN. 21: 455, 1931.

# AN ANALYSIS OF 575 CASES OF ECLAMPTIC AND PRE-ECLAMPTIC TOXEMIAS TREATED BY INTRAVENOUS INJECTIONS OF MAGNESIUM SULPHATE\*

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TO BE orthodox, one should start a paper on the treatment of the eclamptic toxemias with the statement, that until the cause of eclampsia is discovered, a satisfactory treatment is not possible. This statement, or a similar one, is made by nearly all the writers on this subject, but I find myself unable to subscribe to this stand.

Before discussing treatment, it might not be amiss to consider the etiology; not with the idea of adding a new theory as to the etiology of this "disease of theories" but rather to explain clinical results in preventing the occurrence of this clinical syndrome in properly supervised pregnancies.

Clinically, the eclamptic toxemias may be divided into, (1) the true, or hepatic toxemias, (2) the nephritic toxemias, and (3) the nephritic toxemias with a superimposed true eclamptic factor.

The eclamptic attack in a chronic nephritic is readily explained. The kidneys, which are just maintaining the balance of health in the nonpregnant condition, are unequal to the additional burden placed on them by the pregnancy, and a greater or lesser degree of kidney insufficiency results in the toxic attack. This type of eclampsia tends to recur earlier in each succeeding pregnancy.

When we consider the etiology of the true or hepatic type, we are confronted with such an abundance of theories as to give this syndrome the name of the "disease of theories." At first, we had the pathologic era, in which the cause was sought in the changes found at autopsy, then the bacteriologic era, when the cause was sought in a specific microorganism; local foci of infection, dietary indiscretions, absorption of fetal or placental products, the breasts, all have been indicted as the possible elusive cause of eclampsia; and now, in this endocrine era, it is no more than should be expected, that endocrine dysfunction should be accused. Anselmino, Hoffman and Kennedy<sup>1</sup> make a case against the posterior lobe of the hypophysis, accusing its hyperfunction of being a causative factor in eclampsia. And yet, with all the earnest study and investigations of laboratory workers and clinicians, we find the statement made year after year that we are no nearer a solution of the problem.

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I believe this to be due to the fact that there is no single specific cause of the eclamptic syndrome, in other words, that while it may be a clinical entity, it has not a specific etiology.

To me, the eclamptic syndrome is a complex toxemia, originating in the pregnant condition, which successively involves liver and kidneys, thus adding to the original toxemia, the toxemia of liver and kidney insufficiency.

Whatever the original toxemia is, I believe it to be comparatively mild, requiring some activating cause to bring about the eclamptic attack.

Among such possible activating causes are dietary indiscretions, local foci of infection, acute infectious processes and as secondary foci, placental infections.

With this conception of the etiology of the eclamptic attack can be explained the success of proper prenatal care in reducing the incidence of eclampsia, and it also explains the failure to obtain a specific cure.

In a former paper,<sup>2</sup> I discussed in detail this conception of the etiology. When we consider the treatment, we find as much confusion as to the proper treatment as there has been in the attempt to find the cause of the eclamptic attack.

Treatment advocated may be divided into two classes, viz.: active surgical interference and conservative medical treatment, with a possible third class, the "mittleren linie therapie" of the Germans, the middle line therapy.

✓ Surgical attack has, for the most part been directed against the pregnancy, viz., induction; accouchement forcé, or cesarean section. Surgery has not been limited to this, however, as there have been such radical and bizarre procedures as surgical cranial decompression, total hysterectomy, ablation of the breasts and kidney decapsulation advocated and practiced. These latter procedures, have, fortunately, never become popular. The preponderance of opinion in this country is definitely in favor of conservative medical treatment, rather than subjecting these very poor operative risks to the additional burden of a surgical procedure.

✓ The medical treatment as advocated in different clinics is also varied and some of the methods are antagonistic to each other.

Some years ago,<sup>3</sup> the forcing of water, to the extent of tubing the patients every four hours and pouring water into them, 1 to 1½ liters at a time, was advocated and in August of this year, Arnold and Fay<sup>4</sup> in a valuable article lay the greatest stress on dehydration, balancing the liquid intake against the output.

The Stroganoff treatment of sedation with morphine and chloral and noninterference with the pregnancy is so well known, that I need

only mention it. It forms the basis of most of the conservative treatment of today.

I wish to devote this paper to a consideration of the intravenous magnesium sulphate treatment as developed at the Los Angeles General Hospital in the past eight and one-half years. This is essentially a sedative, dehydration therapy. ✓

At the outset, it would be well to consider what we expect to accomplish by treatment. If we are convinced that the eclamptic syndrome is the result of a complex toxemia and that there is no single specific etiologic factor, then we must give up the hope of ever obtaining a specific cure. Treatment must be directed against the results of the toxemia, symptomatic or empiric treatment, if you please, rather than at the ultimate cause.

The problem may be divided into three parts, first and most important, the proper supervision of the pregnant woman. Hygienic and dietary regulation, the elimination, as far as possible, of all local foci of infection, and protection against acute infections, will in the great majority of pregnancies prevent the occurrence of a toxemia; second, the treatment of preeclamptic toxemias, whether of the nephritic type or the so-called true or hepatic type; and third, the treatment of the eclamptic attack itself.

It is the intravenous magnesium sulphate treatment of the last two classes, preeclamptic toxemias and eclampsias that I wish to discuss.

In the preeclampsies, the objectives of treatment should be, first, to antidote as far as possible the effects of the toxemia; second, to help the crippled emunctories by proper regulation of diet; third, to stimulate the elimination of toxins; fourth, to eliminate as far as possible all exciting causes; and fifth, to terminate the pregnancy as conservatively as possible *before the onset of convulsions*, if the results of treatment are not satisfactory.

In the eclamptic, our first objective should be the control of the convulsions and coma, in order to minimize the danger of fatal accidents, such as cerebral hemorrhage, acute cardiac decompensation, pulmonary edema, or aspiration pneumonia occurring during the convulsion or coma; second, in the antepartal case, to conserve the pregnancy, if possible, until the active eclampsia is overcome, and in the intrapartal case, to terminate the labor as conservatively as possible, in order to minimize the additional burden put on the patient; and third, to help elimination and endeavor to combat the results of the toxemia.

These results, I believe, can be best accomplished by magnesium sulphate, which we prefer to give intravenously, aided by intravenous injections of glucose.

Since our first report,<sup>5</sup> in 1925, there have been reports from various other clinics, many favorable, others not so favorable.



M. P. Rucker,<sup>6</sup> in discussing the late sequelae of eclampsia reports the results in three series of his cases. He said, "Group 1, 38 cases with 12 deaths (31.5 per cent), occurred in the period when our chief idea in the treatment consisted of immediate delivery either by accouchement forcé or cesarean section; Group 2, 58 cases with 15 deaths (25.8 per cent), came at a more conservative period when reliance was placed upon morphine, chloral, and bromides with repeated stomach washings and colonic irrigations; Group 3, 110 cases with 6 deaths (5.45 per cent), begins with the advent of magnesium sulphate for the control of the convulsions. Little else was done to these patients except to give a massive dose of digitalis and plenty of water by mouth."

J. R. McCord,<sup>7</sup> reports a mortality of 3 per cent in 100 cases, treated by an initial dose of morphine sulphate gr.  $\frac{1}{4}$  or  $\frac{1}{2}$ , 20 c.c. of 10 per cent magnesium sulphate intravenously hourly and glucose intravenously every eight hours.

DeLee in commenting on this in the 1931 *Year Book* says, "Some lucky fortune must have attended him in attaining such an enviously low maternal mortality, 3 per cent in 100 cases." It would seem that there must have been something more than "some lucky fortune"; possibly the treatment may have had something to do with it.

Adverse comment is not wanting, beginning with Stander's<sup>8</sup> criticism based on animal experimentation. At first, Stander considered the intravenous use of magnesium sulphate unsafe and unwarranted, but after further animal experimentation, conceded that in doses of 20 c.c. of 10 per cent solution it was safe. He, however, limited the amount to 60 c.c. in twenty-four hours for the average sized woman: an amount which in our experience would be wholly inadequate for the severe eclamptics. DeLee in the fifth edition of his textbook, says, "In the United States, in the conservative treatment of eclampsia, it bids fair to supplant Stroganoff's as first choice," only to say in the 1931 *Year Book*, that he has lost faith in magnesium sulphate and has returned to morphine sulphate to control the convulsions, without, however, giving any reasons.

Arnold and Fay<sup>9</sup> make the statement that magnesium sulphate intravenously "is not eliminated through the kidneys, does produce renal inflammation and for the most part is excreted into the large bowel"; and, in their opinion, "several cases of ulcerative colitis may have been precipitated or augmented by the use of this drug, intravenously."<sup>4</sup>

In many thousand injections, we have never seen the slightest effect on the bowels; nor any damage to the kidneys that could be attributed to its use.

Lissner<sup>10</sup> in a paper on the intravenous use of magnesium sulphate in hypertension and allied eye conditions, read before the American College of Physicians in 1932, states that "the intravenous administration of magnesium sulphate does not have any influence on the bowels." He bases the statement on an experience of seven and one-half years and several thousand injections.

Our present report includes 371 preeclamptic cases of both the nephritic and the two eclamptic types, of which 21 developed convulsions (5.6 per cent), and of 225 convulsive toxemias, a total of 575 cases. They are from the services of the author and Dr. L. G. McNeile at the Los Angeles General Hospital.

*Preeclamptics*.—These cases fall into two groups: first, those admitted in labor and found to have a systolic pressure of 150 or over, usually, with albuminuria and to whom magnesium sulphate is given as a prophylactic, and second, those admitted during the last two

weeks of their pregnancies as frankly toxic cases and in whom the intravenous injection is the main feature of the treatment.

Table I shows the results as to group, the occurrence of convulsions and mortality in our two series of cases, the first series included in my report of 1929<sup>12</sup> and the second from July, 1929, to November, 1932.

Maternal mortality of the preeclampsies: Besides the one patient who died after developing convulsions in the first series, there were three deaths of patients who did not develop convulsions, one, a nephritic who had had an early termination of a previous pregnancy, had an induction and died of a surgical shock after her delivery; the second one had an advanced syphilitic hepatitis at autopsy; and the third one had suppurative endocarditis and pulmonary infarcts at autopsy; a gross mortality of 2.8 per cent in the first series of preeclampsies. In the second series of 228 cases, two patients died, 0.8 per cent. One developed a fulminating eclampsia and is included in the mortality of the eclampsies and the second one did not have convulsions, developed an abruptio placentae and was sectioned, a total of 1.6 per cent gross mortality for the 371 patients who came under treatment as preeclampsies.

TABLE I. PREECLAMPTICS TREATED WITH INTRAVENOUS MAGNESIUM SULPHATE

	CASES	GROUP 1	CON- VULSIONS	GROUP 2	CON- VULSIONS	MORTAL- ITY PER CENT
		Prophy- lactic				
To July, 1929	143	55	5	88	6	2.8
July, 1929, to Nov., 1932	228	78	1	150	9	0.8
Total	371	133	6	238	15	1.6

Table II shows the nature of the deliveries in the preeclampsies and eclamptic cases.

As to the babies: Of the 350 patients who did not develop eclamptic convulsions, there were 12 pairs of twins delivered, 270 living babies discharged from the hospital, 14 babies died after delivery, 58 were stillborn macerated fetuses and 20 patients were discharged improved and undelivered.

*Eclampsies.*—In former reports,<sup>2, 11, 12</sup> the first 125 cases treated by intravenous magnesium sulphate were analyzed and discussed. These cases dated from May, 1924, to July, 1929. From July, 1929, to November 1, 1932, there have been an additional 100 cases.

*Mortality.*—In evaluating any method of treatment, the mortality rate is usually taken as an index of the value of the treatment. As for example, Irving is quoted by DeLee<sup>13</sup> as having abandoned the intravenous use of magnesium sulphate because of 13 patients to whom he administered it. 38.4 per cent died while of 98 to whom he did not give it, 25.9 per cent died; the apparent conclusion being that the

magnesium sulphate was in some manner responsible for the greater mortality. Without a critical analysis of the fatalities, I believe any conclusion might be fallacious, especially in a small series of cases. We, for example, have had as many as 32 consecutive cases without any mortality, only to have four deaths in the next seven cases.

I would like to emphasize that our eclamptic cases are, in the great majority, patients who have been unsupervised during pregnancy and most of them coming under treatment after the onset of convulsions, some as long as twenty-four to forty-eight hours after the first convulsion. Only 21 of the 225 eclamptic cases came under treatment before the onset of convulsions. Table III shows our gross and corrected mortalities in the three series of cases comprising this report.

TABLE II. DELIVERIES IN 150 PREECLAMPTICS

SPONTANEOUS	FORCEPS	VERSION	INDUCTION	ABDOMINAL SECTION	VAGINAL SECTION	HYSTERECTOMY	UNDELIVERED
89	9	1	28	19	2	2	10

DELIVERIES IN 86 ECLAMPTIC CASES							
		VERSION BREECH					
38	19	4	2	18	1	1	3

TABLE III. MORTALITY TABLE OF ECLAMPTICS TREATED WITH INTRAVENOUS MAGNESIUM SULPHATE AT THE LOS ANGELES GENERAL HOSPITAL

	CASES	GROSS MORTALITY	CORRECTED
May, 1924, to February, 1926	54	16 $\frac{2}{3}$ %	11.5%
February, 1926, to July, 1929	71	7.0 %	5.7%
July, 1929, to November, 1932	100	16.0 %	10.5%
	225	13.33%	9.5%

If we consider only the mortality percentage, a jump in the rate from 7 per cent in the second series to 16 per cent in the third, might be discouraging and indicate that some modification of the treatment might be responsible for the increase. As a matter of fact in the second group of 71 cases there was little else done than the intravenous magnesium sulphate, while in the last group of one hundred cases, more intravenous glucose was used. We are not abandoning that part of the treatment, however, as a critical analysis of these fatalities will I believe satisfactorily explain the reason.

Of the 16 patients who died, 13 had had convulsions before admission varying in time from one to fourteen hours and in number from 1 to 14 convulsions.

As to the delivery, one was a postpartum eclampsia; one died undelivered, there was one spontaneous delivery, one postmortem section, one accouchement forcé and version, one accouchement forcé and forceps, two bag inductions and forceps, one bag induction and Kristeller

expression, one breech extraction, three cesarean sections, one vaginal hysterotomy, and two forceps extractions.

Three of these patients died within six hours of admission and are excluded in the corrected mortality, three had abruptio requiring operative delivery, three were found at autopsy to be nephritic cases without any liver changes suggestive of eclampsia, and are excluded in the corrected mortality; four had cerebral hemorrhages of greater or lesser extent. One death was probably due to an acute alcoholism, one patient died of the trauma of operative delivery after the eclampsia had been practically overcome, definitely an "error of art."

In evaluating the mortality rate, in addition to the six cases which were excluded, three because they were moribund when they first came under treatment and three because they were straight nephritics (proved at autopsy) and died of uremia after the convulsions were controlled, one patient died as a direct result of operative trauma, one was carried too long as a preeclamptic, and one was in all probability an alcoholic poisoning. If these three deaths which should not be charged as failures against the treatment were also excluded in the corrected mortality, we would have seven deaths in 91 cases for a corrected mortality of 7.8 per cent.

As to the babies in 86 antepartal and intrapartal eclamptics in the last group of 100 cases, there were 3 pairs of twins, 55 living babies discharged from the hospital, 5 premature babies died after delivery, 28 were stillborn babies and one mother died undelivered.

*Intercurrent Eclampsia.*—In our first series of cases, we had 28 per cent of so-called intercurrent eclampsias, i.e., those recovering from the eclampsia and going from several days to several weeks without recurrence of eclampsia. In our second series, of 37 antepartum eclampsias, there were 35 per cent which became intercurrent. In the present series, there were 82 antepartal cases, of which 19 (23 per cent) went from two days to two months from the control of the convulsions until the termination of pregnancy without further convulsions. Of these, 13 went into labor and delivered spontaneously, one had a forceps delivery, three had sections and two were discharged undelivered and were delivered at home, three weeks and two months, respectively after discharge from hospital.

The most interesting of these intercurrent eclampsias was the patient who went two months after the control of the eclampsia to a spontaneous labor, being delivered of a full-term healthy baby. This patient, a gravida i, was admitted January 6, 1931, from the Pasadena Hospital where she had been admitted twenty-four hours before; she had had five convulsions before admission to the Pasadena Hospital where she was placed on a Stroganoff régime. Her convulsions were controlled until 8:30 A.M., January 6, 1931, when she was transferred to the Los Angeles General Hospital. During the twenty-four hours she was in the former hospital she had received 3 gr. of morphine sulphate and 60 gr. of chloral. On admission to the Los Angeles General Hospital she was in a convulsion. She was placed on intra-

venous magnesium sulphate and intravenous glucose. She had convulsions at varying intervals until thirty hours after her admission, having seven convulsions; during this time, she had eight injections of magnesium sulphate (160 c.c.) and two intravenous injections of 50 c.c. of 50 per cent glucose and morphine sulphate gr.  $\frac{1}{4}$ . Treatment was continued and no further convulsions occurred. She was discharged, undelivered, on January 29, 1931. Blood pressure was 110/70. She placed herself under the care of Dr. Skelton of Pasadena, who reported that she was spontaneously delivered of a full-term living child on March 1, 1931, fifty-four days after onset of eclampsia, having had no further eclamptic symptoms after leaving the hospital.

During her stay of three weeks at the Los Angeles General Hospital, she received a total of 27 intravenous magnesium sulphate injections (540 c.c.). In seeking an explanation of this recovery from a clinically severe type of eclampsia (13 convulsions during sixty hours), with an uninterrupted pregnancy, we sought for the probable etiologic factor in this particular case. We found that a few days before the onset of eclampsia the patient had had an abscessed tooth extracted. I believe that the absorption of toxins from the infected abraded tooth socket precipitated the eclamptic attack and by the time it was controlled, further absorption was stopped by the healing of the tooth socket and as fortunately in this case there was no secondary involvement of the placenta, the pregnancy continued as a normal one.

*Cesarean Section.*—I have for many years followed the conservative treatment of eclampsia as opposed to the radical surgical treatment of these highly toxic patients, as I believe that eclampsia per se is a contraindication to operative attack. In the presence, however, of active labor and cephalopelvic disproportion, or other urgent obstetric indication, such as abruptio placentae, section must be done notwithstanding the poor operative risk, also in the preeclamptic or the eclamptic, who has recovered from the convulsive attack, and who is not responding satisfactorily to treatment, I believe section is at times indicated as an aid to the treatment of the toxemia.

In our first two series in which there were 100 ante- and intrapartal cases, section was done six times, in the third series of 100 cases in which there were 86 ante- and intrapartal cases, there was one post-mortem section, one vaginal hysterotomy, one hysterotomy and sterilization in an eight weeks' pregnancy and 15 abdominal sections.

The indications for the abdominal sections were abruptio placentae in 4 cases, a previous section for toxemia, in one case; mechanical dystocia in 2 cases and persistent toxemia in 8 cases, in one of which convulsions recurred two days after they were controlled. In only three of these cases was the operation done during the eclamptic attack, the others being done from thirteen hours to thirteen days after the control of the eclampsia. In two of the patients operated upon during the attack, the indication was cephalopelvic dystocia and in one case, continuation of the toxemia with recurrent convulsions (after forty-eight hours) was the indication.

There were three deaths among those sectioned, one an abruptio placentae, sectioned under spinal, forty-eight hours after control of

convulsions; one chronic nephritic, sectioned sixty hours after the eclamptic convulsions were controlled but while the patient was comatose, the coma continuing until death, in uremia five days after operation; and one died twenty-eight hours after operation, and had subpial hemorrhages at autopsy.

Our present routine is as follows:

*Preeclamptic Cases.*—

1. Usual sedative and eliminative treatment and dietary regulation.
2. Blood pressure 150 systolic, or higher; 20 c.c.  $MgSO_4$  10 per cent solution intravenously; blood pressure to be taken twice daily and the intravenous magnesium sulphate repeated if blood pressure does not come down.
3. Surgical interruption of pregnancy only to be done with the consent of senior attending obstetrician.

*Eclampsia.*—

1. Twenty cubic centimeters of 10 per cent solution  $MgSO_4$  intravenously as soon after first convulsion as possible.
2. Repeat injection of  $MgSO_4$  every hour until convulsions are controlled (attending obstetrician to be notified if convulsions are not controlled within three hours).
3. Blood pressure to be taken every hour after convulsions are controlled and if it begins to rise, again nearing its height at time of convulsion, repeat  $MgSO_4$ ; also repeat if convulsions recur.
4. Intravenous glucose, either 1000 c.c. of 10 per cent solution for patients with little edema or 50 c.c. of 50 per cent solution in those with marked edema; as indicated for scanty urinary output and for patients with low  $CO_2$  combining power, especially if delivery or operation is to be done.
5. If patient is comatose, or very restless in a semicomatose delirium and blood pressure is falling, give chloral gr. xx and NaBr lx per rectum.
6. All patients to be prepared for delivery as soon as they are quiet enough to do so.
7. Utmost quiet to be observed and nurse to be constantly with patient until coma has cleared.
8. Oxygen inhalations after each convulsion until breathing is normal.
9. If patient is in labor, nitrous oxide for pains.
10. If in second stage labor and proper progress is not being made, low forceps extraction or version may be done with consent of attending obstetrician.
11. *Cesarean section only to be done for absolute obstetric indications and with consent of senior attending obstetrician.*

Variations from the above routine only to be made on direction of the attending obstetrician.

#### CONCLUSIONS

1. In view of the varied etiologic factors which may produce the eclamptic syndrome, it is in all probability impossible ever to obtain a specific cure for eclampsia.

2. The objectives of treatment in the preeclamptic should be (a) to overcome the effects of the toxemia by sedation and elimination; (b) to remove as much work as possible from the embarrassed emunctories by proper regulation of diet, with particular reference to the balancing of the fluid intake with the output; (c) to terminate pregnancy as

conservatively as possible, where there is not proper response to treatment, *before the onset of convulsions*.

3. The chief objective of treatment of the eclamptic should be the control of the convulsions and the protection of the patient against accidents during the convulsions and coma; surgical termination of the pregnancy during the eclamptic attack is only justified in patients in labor, presenting some urgent obstetric indication.

4. In our experience, the sedation and elimination necessary, is best secured by intravenous magnesium sulphate in sufficient dosage, aided by intravenous injections of glucose.

5. A series of 225 cases of eclampsia and 350 cases of preeclampsics treated in this manner is reported. The gross mortality for the entire series, preeclampsics and eclamptics, is 5.9 per cent. The gross mortality for the active eclamptics is 13.33 per cent and the corrected mortality 9.5 per cent.

#### REFERENCES

- (1) *Anselmino, Hoffman, and Kennedy*: Edinburgh M. J. 30: 1932. (2) *Lazard, E. M.*: Am. J. Surg. 3: 1927. (3) *Davidson, H. J.*: Surg. Gynec. Obst. May, 1921. (4) *Arnold and Fay*: Surg. Gynec. Obst. August, 1932. (5) *Lazard, E. M.*: AM. J. OBST. & GYNEC. 9: 178, 1925. (6) *Rucker, M. P.*: Trans. Am. Assn. Obst. Gynec. & Abd. Surg. 44: 1931. (7) *McCord, J. R.*: J. Tenn. M. A. August, 1931. (8) *Stander, H. J.*: AM. J. OBST. & GYNEC. 12: 633, 1926. (9) *Arnold and Fay*: Surg. Gynec. Obst. 55: 1932. (10) *Lissner, H. H.*: Paper read at Meeting of the American College of Physicians, 1932. (11) *Lazard, E. M., Irwin, J. C., and Fruwink, J.*: AM. J. OBST. & GYNEC. 12: 104, 1926. (12) *Lazard, E. M.*: Trans. Am. Assn. Obst. Gynec. & Abd. Surg. 42: 240, 1929. (13) Year Book of Obstetrics, 1931.

### HEMORRHAGE FOLLOWING CESAREAN SECTION\*

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OF THE familiar causes of postpartum hemorrhage, atony, lacerations, and retained placental fragments, atony of the uterus alone is significant after cesarean section. Lacerations are excluded, obviously, by the method of delivery employed and complete removal of the placenta should be insured, as there has been ample opportunity to inspect the uterine cavity or explore it manually. On the other hand, the incidence of atony is probably increased because the anesthesia required for cesarean section is deeper and more prolonged than for most deliveries through the birth canal.

Imperfect suturing of the uterine incision incurs an additional risk of hemorrhage in these cases, a risk much greater whenever the incision passes through the placental site. Inaccurate approximation of the edges of the wound may leave open a sinus, divided at the operation, and oozing will continue until thrombosis stops it, unless death

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intervenes. From such a source, indeed, severe hemorrhage becomes possible, though unlikely, since everyone now follows Säger's advice to close the uterus in layers, approximating its tissues in the same relationship as before the incision was made.

It is inevitable that some bleeding should follow the operation, comparable in amount with that observed after normal delivery. This limit may be exceeded when the uterus has been distended excessively by the pregnancy, or fibroids are present. And still other pathologic phenomena, as we shall see, occasionally favor postpartum hemorrhage. But, whatever its causation, the severity of the complication may be estimated by watching the vaginal discharge, the pulse rate and the blood pressure. These trustworthy guides more often serve to reassure those interested but they may have the opposite influence, giving timely warning of a situation soon to pass beyond control. This has twice been my experience. In one instance death occurred, in the other the patient finally recovered. I shall describe these cases in the order they were met with in practice, the fatal one first.

Mrs. J. H. was delivered twice by cesarean section for a generally contracted pelvis. The first operation was performed under unfavorable conditions inasmuch as a respiratory infection was present. But there was no alternative, for labor had already begun. A febrile convalescence was attributed to bronchitis.

Two years later the second pregnancy proceeded normally to term and again cesarean section was performed under nitrous oxide gas anesthesia. At this operation immediately upon opening the abdomen dense omental adhesions were encountered. Incision of the uterus was attended with profuse bleeding as the placenta was attached anteriorly.

The most momentous finding was a scar three inches long and nearly an inch in breadth. In this area the thickness of the uterine wall was approximately one-third less than elsewhere. The recently made incision was parallel to the former one and more than an inch to the right of it, so that the closure could be made without penetration of the scar by the sutures. Chromic catgut was used and more care taken than usual to assure accurate approximation of the edges of the wound because the problem was an extraordinary one. The patient left the table in good condition; the pulse rate was 120 and the blood pressure 110/70.

Half an hour after she was returned to her room the bleeding became profuse, the pulse more rapid and the blood pressure lower. There was no improvement after appropriate medication or the intravenous administration of salt solution. Consequently, a transfusion of 500 c.c. of blood was given with a highly satisfactory result. But the improvement was only temporary. Another hemorrhage was followed by an exacerbation of the unfavorable symptoms. As a last resort the uterus was packed with sterile gauze which controlled the bleeding for a short interval. Within ten minutes the third severe hemorrhage began; the patient collapsed and died four hours postpartum while preparations were being made for a second transfusion.

Permission could not be obtained for an autopsy. It is unlikely this would have added to what we already knew unless it had disclosed imperfect suturing of the uterine incision. That contingency, I believe, may be excluded as due care was taken in approximating the tissues. To my mind the correct explanation of the



complication was atony of the uterus, especially of the placental site where the normal mechanism for the control of hemorrhage was impaired by the presence of fibrous tissue, the result of imperfect healing after the first cesarean section. So strongly am I impressed with the correctness of this view that in the future when the placenta is implanted over an imperfect scar, it will be my practice to remove the uterus, if the scar may not be excised satisfactorily.

My second experience with postpartum hemorrhage after cesarean section ended more happily. The patient recovered and the cause of the complication was demonstrated beyond reasonable doubt.

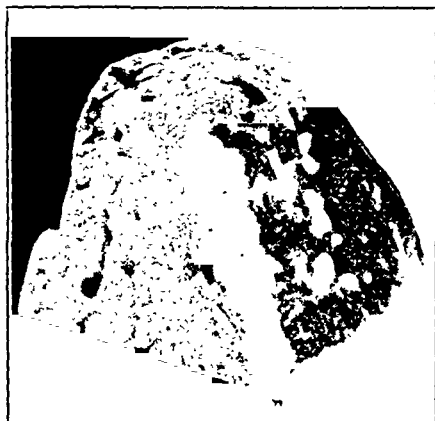


Fig. 1.—Section through the fundus. The black, sharply defined areas are thrombosed veins. The more diffuse, gray mottling is due to intermuscular hemorrhage. Blood clot in the uterine cavity.



Fig. 2.—Horizontal section through placental site. Opening below identifies location of incision made at the cesarean section. The pathologic changes are conspicuous in the lateral portions of the uterus. The central zone appears more normal.

Mrs. C. A., primipara, thirty-one years old, with estimated date of confinement December 12, experienced a miserable pregnancy from the beginning. She reached the eighth month of gestation thoroughly worn out with nausea, vomiting, headache, chronic nasal catarrh, and edema of the feet. The diagnosis of twins was established radiographically and a profound anemia disclosed by the blood count: Hemoglobin 46 per cent, red cells 2,890,000, leucocytes 7000, distributed as follows: polymorphonuclear neutrophils 72.5 per cent, lymphocytes 21.5 per cent, large mononuclears and transitionals 4.5 per cent, eosinophiles 1.5 per cent.

Admitted to the hospital October 30 for rest and recuperation, she was kept in bed and treated for anemia. After five days of medicinal and dietary treatment a transfusion (500 c.c. blood) was given. A typical, though delayed, reaction in-

cluded not only rise of temperature and pulse but headache, backache, chilly sensations, and false labor pains. The urine, previously normal, showed a heavy trace of albumin, and the blood pressure rose from 110/70 to 120/80.

November 6 the temperature and pulse were normal; the abdominal pain, backache, and headache ceased; but the blood pressure and urine findings remained as the day before.

November 7 a blood count demonstrated the benefit derived from the transfusion. The blood pressure was 130/90. The albuminuria became measurable, 1 gram to the liter (0.01 per cent).

November 8: The blood pressure reached 150/100, the albuminuria 0.15 per cent. Sluggish, painful uterine contractions returned. Labor was beginning and the toxemia increasing. A funnel pelvis offered opportunity for further complications and cesarean section was selected as the most advisable method of delivery.

A classical operation was performed by Doctor Henry Shaw and myself under gas anesthesia (7:54 to 8:30 P.M.). The single ovum twins were males. The placenta implanted on the posterior surface of the uterus was removed manually.

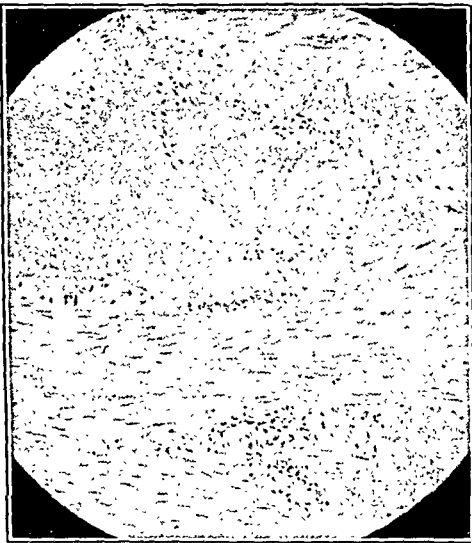


Fig. 3.



Fig. 4.

Fig. 3.—Microphotograph showing thrombosed vein, intermuscular hemorrhage, and uterine muscle, mostly normal.

Fig. 4.—Microphotograph illustrating dissociation of the uterine muscle-cells by the extravasation of blood.

Spontaneous separation had not begun. The uterine incision was closed with chromic catgut in three layers, mucosal, intermediate and peritoneal. Nothing noteworthy was found in the pelvis, except the absence of the left tube and ovary, the removal of which we knew of from the history. The loss of blood during the operation impressed us as excessive and was estimated to be 500 c.c. At the end of the operation the pulse was 100 and blood pressure 110/70. For several hours after operation the patient's condition was satisfactory but at 2:00 A.M. November 9 (five and one-half hours after cesarean section), there was a sudden hemorrhage of about 500 c.c., with characteristic changes in pulse and blood pressure. Transfusion restored the patient, and resulted in a drop in pulse rate to 80 and a rise in blood pressure to 130/90. Two hours later there was a second hemorrhage similar to the first. The pulse became imperceptible, the systolic pressure fell to 70. Shortly afterward the uterus was removed by hysterectomy and 600 c.c. of blood transfused during this operation, performed nine hours after the cesarean section. After a stormy convalescence the patient recovered.

The uterus fixed in formalin was shipped to Doctor J. Whitridge Williams for study. I am indebted to him for the following pathologic diagnosis: "The central parts of both walls of the uterus appeared normal while the lateral portions presented a bluish, mottled appearance suggestive of that found in certain cases of premature separation. The uterine cavity was free. The placental site was identified on the posterior wall. This area on section showed many large vessels, most of which were empty, while others appeared to be thrombosed.

"Sections hardened and stained for microscopic study showed loose edematous connective tissue just beneath the superficial layer of muscle. In places free blood was found in the tissue. Extending through the muscularis were many large thrombosed veins. Numerous small areas of intermuscular hemorrhage were seen which in places had led to marked dissociation of the muscle fibers. Usually such areas were in relation to small veins which they often surrounded completely but nowhere in the specimen could I find endothelial or other changes to account for the escape of blood.

"In general the picture is identical with that noted in certain cases of premature separation, and I am inclined to associate the postpartum bleeding with it and to attribute it to interference with uterine contractions by the intermuscular hemorrhage. In other words, we have the lesions associated with premature separation occurring in a uterus some hours after the placenta has been removed. The existence of a toxemia makes such an explanation even more plausible."

Doctor Williams was impressed by the histologic findings and intended to use them, together with other data, in an essay but an untimely death prevented the fulfillment of his plan. The lesions observed are not unfamiliar but heretofore they have been found only in association with uteroplacental apoplexy. This was first described by Couvelaire in 1912 and, subsequently, studied by Essen-Möller and by Williams whose monographs on the subject beginning in 1915 are well known. The unique interest of the present case relates not only to the development of the lesions independently, without premature separation of the placenta, but also to their development subsequent to delivery. During pregnancy, it is worth while to recall, this patient had experienced no vaginal bleeding. At the time of the cesarean section the placenta was firmly attached to the posterior wall of the uterus and its musculature presented no gross abnormality. For a period of approximately six hours postoperative, the lochial discharge of average amount indicated that the uterus possessed its normal capacity for contractility. All these facts confirm the view that the intermuscular hemorrhages were initiated during the postpartum period, dissociating the muscle cells and depriving them of their hemostatic function. It may be that similar lesions are responsible for other cases of late postpartum hemorrhage, irrespective of the mode of delivery.

The independent nature of the development of the lesions in this instance aids in establishing the sequence of events in cases of uteroplacental apoplexy. As premature separation of the placenta did not initiate the lesions, it seems reasonable to infer that it does not usually

do so. The order of events would appear to be the reverse, namely, first the intermuscular lesions and later the retroplacental hemorrhage forcing the organ from its attachment.

The toxemia, widely accepted, as fundamental in the causation of the intermuscular hemorrhages was present here. On the other hand, torsion of the uterus, another hypothetical explanation, may definitely be excluded. During the interval between the two operations the patient was flat on her back, and subjected to no bodily manipulation likely to cause rotation of the uterus. Furthermore, at the second operation the organ was lying in normal position.

What is the frequency of severe hemorrhage after cesarean section? Stoeckel's comprehensive monograph on postpartum hemorrhage includes a tabulation of fatalities due to atony of the uterus. Of 19 deaths attributed to this complication, 4 followed cesarean operation. Otherwise textbooks are silent and monographs on cesarean section and postpartum hemorrhage alike omit discussion of the subject. Personal enquiry, however, has served to assure me that others have encountered the complication. From a reliable source I learned that several instances have occurred in this vicinity and a friend in the East writes of fatal hemorrhage after cesarean section in one of his patients as well as three more in the practice of a colleague. The literature is mute, I fancy, for a very human reason. Tragic experiences are preferably forgotten, whereas publication makes them memorable. This reflection is not prompted by what may be the negligence of others but by my own psychology. Unless I err in self-analysis, I should not have felt duty bound to record the first case of this report, the fatal one, had not the second revealed pathologic changes worthy of consideration.

With regard to treatment my experience clearly points to the wisdom of resorting to hysterectomy. But this treatment will never be undertaken lightly. The hazard of a second abdominal operation quickly following the first is too familiar to need emphasis. Consequently, conservative measures including the administration of salt solution intravenously and blood transfusion imperatively demand preliminary trial. Yet procrastination, as I have learned, may be of fatal consequence. Therefore, if the benefits of conservative treatment begin to wane, as the pulse and blood pressure will show, the removal of the uterus becomes obligatory.

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#### REFERENCES

- Sänger*: Der Kaiserschnitt bei Uterusmyomen, Leipzig, 1882. *Stoeckel*: Pathologie u. Therapie der Nachgeburtshutungen, Arch. f. Gynäk. 125: 1-148, 1925. *Williams*: Obstetrics, New York, 1930, ed. 6, 989-997.

## NICOTINE IN BREAST MILK\*

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DURING the past decade an enormous increase in the incidence of smoking among women has occurred. Some eight years ago I estimated that approximately one in five obstetric patients smoked. While I have realized that this proportion was increasing, I was surprised to find that 38 of the last 100 of my patients smoked, the range being from "occasional" to 25 cigarettes per day. "Occasional" smokers averaged less than 1 cigarette daily, and constituted nearly two-thirds of the group. The remainder was equally divided between "moderate" smokers, averaging 1 to 7, and "heavy" smokers, using 8 to 25 cigarettes daily. Whether this growing incidence is another expression of the age in which we live, or is a tribute to the clever advertising and skillful merchandizing of the tobacco manufacturers, or is due to other factors, is, after all, immaterial. It is enough for our purposes to realize the fact that a large percentage of our patients smoke more or less regularly, and to consider what effects, if any, this fact may have particularly upon the physiologic processes concerned in reproduction and lactation.

In 1927 Hatcher and Crosby<sup>1</sup> demonstrated the presence of nicotine in the milk of a nursing mother who had been smoking 20 to 25 cigarettes daily. Their material was obtained under somewhat artificial circumstances, in that the subject, becoming interested in the experiment, was smoking much more than was her custom and used 7 cigarettes in the two hours prior to the collection of the milk. Granted that the conditions under which this test was made were highly atypical, it still is difficult to understand how the importance of their finding has been so generally overlooked, as it is scarcely mentioned by other workers in nicotine research, and seemingly has been missed entirely in obstetric literature.

Under even more abnormal circumstances, Emanuel<sup>2</sup> reported in 1931 a series of experiments upon the milk and urines of 10 nursing mothers. His patients smoked from 6 to 15 cigarettes within a period of two hours, either inhaling or allowing the smoke to escape slowly through the nostrils in order to secure maximum absorption. He found nicotine in both milk and urine when the subject smoked 7 or more cigarettes within two hours of the obtaining of the samples. This was most con-

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centrated in four to five hours and occasionally was noted seven to eight hours after smoking. The percentage of nicotine in the tobaccos used in this experiment is not stated, but, in general, European cigarettes contain considerably less than do the common American brands.

In this paper, which is to be considered as a preliminary discussion, I wish to report the detection of nicotine in breast milk by ether extraction and biologic test, and to consider whether we should concern ourselves with the tobacco habits of our patients. In the experiments, samples of milk from mothers who smoked were obtained by suction pump at the 10:00 A.M., 2:00 P.M., and 6:00 P.M. nursing periods, and were kept tightly bottled and refrigerated until the extraction was begun. In each instance, as large as possible a sample was secured and all the milk from each patient was used as a single specimen. Patients were asked as to the number of cigarettes smoked during the day, and also as to the brand used, but were not asked to alter either their usual rate or mode of smoking so that nicotine elimination under average conditions might be observed.

#### METHOD

The extraction of the nicotine in milk was accomplished by modification of the method described by Hatcher and Crosby, and may best be presented by detailing one experiment:

Mrs. B., a primipara, six days postpartum. Smoked 9 cigarettes (nicotine percentage 2.17) and attempted 3 pipesful between 7:00 A.M. and 6:00 P.M. Milk collected at 10:00 A.M., 2:00 P.M., and 6:00 P.M. Total amount, 180 c.c. To the milk was added 11.5 c.c. of 20 per cent sodium hydrate. It was then shaken vigorously with 600 c.c. of ether and separated. The ether addition, shaking, and separation was twice repeated so that the milk was shaken with 10 times its volume of ether divided into 3 portions. To the ether was added sufficient dilute sulphuric acid to make it acid to litmus, enough water added to make a dividing line distinct, and shaken vigorously. The ether was separated, a few drops of dilute sulphuric acid added to it, and reduced by boiling to approximately 15 c.c. This was added to the acid residue of the preceding step and made alkaline by the addition of 20 per cent sodium hydrate, drop by drop. Repurification was accomplished by shaking with 10 volumes (400 c.c.) of ether, separating, adding dilute sulphuric acid drop by drop to the ether until acid in reaction, and concentrating by boiling to approximately 2.0 c.c., the end-stage being over a water-bath. The concentrate was made neutral to litmus with sodium bicarbonate. No odor of nicotine was perceptible. Fifteen minims were injected into the lymph sac of a 20 gm. grass frog. In thirty seconds the frog's respiration became very rapid. In one minute fibrillary twitchings of muscles were noted and the rear feet were drawn up over the body. The pupils were definitely contracted. Next the legs became somewhat paralyzed, and when the frog was held suspended, the hind legs hung crooked across each other in a typical "scissors" effect, while the forelegs drooped with palmar surfaces facing forward. The frog was now pithed, the vagus nerve exposed, and tested with a one-cell induction current produced with the secondary coil 8 cm. from the primary. The pericardium was opened and the heart suffused with the extract. After a few minutes, testing with the induction current with the secondary coil moved down to 4 cm. had no effect, indicating paralysis of the vagal ganglion cells in the cardiac musculature. Index, positive.

The reactions in the frog constitute a very delicate test for nicotine, much more delicate than chemical tests. Not only is it definite, but also a rough quantitative analysis is available. Respiration will be increased in a 20 gm. frog by 0.005 mg. Muscle fibrillation occurs if the dose be increased by one-fifth, and twice the minimal dose will cause the leg paralyzes and "scissors" reaction. I am at present unable to state what strength solution is necessary to cause paralysis of vagus ganglion cells in hearts suffused in situ.

In the experiment cited, there was sufficient nicotine to have given two positive frog tests or at least 0.02 mg. This was roughly two-thirds the amount that might have been demonstrated had all the milk been saved for the entire twenty-four hours, since the 10:00 P.M. and 2:00 A.M., and to a lesser extent, the 6:00 A.M. outputs may be assumed also to have contained nicotine. Furthermore, Hatcher and Crosby, in working with measured amounts of nicotine base added to milk and using the standards noted above, were able to recover but from one-eighth to one-half the nicotine present. My patient, therefore, probably eliminated in her milk from 0.06 to 0.24 mg. of nicotine in twenty-four hours at the time of this particular test.

Two other tests suggest that the rate of nicotine elimination may depend upon the degree of breast activity. In the first, a young primipara, on the fifth day postpartum, smoked 5 cigarettes (nicotine content, 2.53 per cent) and secreted 225 c.c. of milk. The frog test was questionably positive, so classed because the entire amount of the final concentration (14 min.) was injected into the frog's lymph sac, giving typical reactions, but the vagal paralysis test was not done. In the second, a young primipara consumed 14 cigarettes (2.17 per cent nicotine) and secreted only 35 c.c., obtained at two pumpings. The concentrate caused the frog to show evidence of shock, but there was not typical muscle twitching or posture, and the vagus endings were not affected by bathing the heart in the extract. This entire latter test, however, loses some significance because the experiment was not promptly completed after the concentration, and the nicotine present might have decomposed.

Thus far, the milk from only four mothers has been conclusively shown to contain nicotine, with positive reactions both in skeletal muscle and vagus cell paralyzes. Three other specimens are classed as questionable, although these would be called positives according to the usual standards. In no experiment has a chemical test been positive, nor has the odor of nicotine been noted. This latter test was observed by Hatcher and Crosby. Negative findings under circumstances which would seem to have insured positive tests suggest that the method of extraction and concentration should be improved before attempting a larger series.

As routine, I have advised my patients to moderate their smoking during pregnancy and to abstain entirely during lactation. While the report of Hatcher and Crosby had escaped me, I had noted that nicotine had been detected in perspiration<sup>3</sup> and that breasts were considered as modified sweat glands.<sup>4</sup> Correlating these statements resulted in the hypothesis that lactating breasts would assist in nicotine elimination and gave rise to the questions as to whether the nicotine so excreted would in any way affect the nursling, and whether lactation would be influenced.

Opinions as to the effect of nicotine upon growth vary widely. Chase,<sup>5, 6</sup> and Hunter and Haley<sup>7</sup> reported early growth stimulation upon feeding young chicks small quantities of nicotine and tobacco respectively. This view is in harmony with measurements on students at the University of Minnesota,<sup>8</sup> but is opposed by the work of Richon and Perrin,<sup>9</sup> and Dixon and Lee<sup>10</sup> on rabbits. Thienes,<sup>11</sup> and Behrend and Thienes<sup>12</sup> found practically no effect upon the growth of white mice, white rats, and rabbits when these animals were injected with nicotine in quantities sufficient to cause convulsions. However, when one considers the statement of Cushney that "Nicotine is about as poisonous as prussic acid," it seems logical to consider that even minute quantities of nicotine administered through breast milk might upset digestive processes to the extent of endangering the early growth of delicate babies.

As might be expected, and probably due to personal bias of the various investigators, there is also a wide divergence of opinion as to the possible effects of nicotine upon fertility and lactation. Chiasson<sup>13</sup> mentions the exceptional fertility and lactation in a group of French families, the women of which were habitual and constant pipe smokers, while Mgalobeli<sup>14</sup> noted in women employed in tobacco factories a marked decrease in the number of pregnancies and increased frequency of miscarriages and infant deaths, all of which he attributed to the direct and indirect effects of nicotine upon the sex organs. Sajous,<sup>15</sup> after recounting a list of symptoms said to be due to nicotine, states that "the ovary of the female habitué shrivels into a small kernel, hard and yellow"; and Greenhill<sup>16</sup> comments, "Animal experimentation has proved that nicotine can produce disastrous results in females and their offspring. Without doubt excessive smoking effects women more than men." H. C. Williamson, H. S. McCandlish, and Ogden Conkey, all of the Department of Obstetrics of Cornell Medical School, informed Hatcher and Crosby that they had never noted any diminution in the secretion of milk, nor any effects upon a child that could be ascribed to smoking by the mother. Emanuel did not find that lactation was decreased by excessive smoking, but, because two infants had slight gastrointestinal upsets, which might have been due to nicotine, he concluded that not more than 15 cigarettes should be permitted the nursing mother. At the present time I have one patient who states that 20 to 25 cigarettes daily did not hinder her from producing an over-supply of milk during two lactation periods, and another patient who reports the same concerning her sister; but, on the other hand, I have yet to observe a patient averaging 8 or more cigarettes daily whose lactation was adequate at three months.

The direct evidence upon animals is scant but highly suggestive. Hatcher and Crosby found that injection of large amounts of nicotine into a cow and a lactating cat caused a temporary suppression of secretion which lasted some hours. Small doses, according to Cushney, give a temporary stimulation of secretions, followed by a depressed activity.



One of the difficulties encountered in securing milk samples was that in several instances breasts were relatively inactive on the days testing could be done. Due to limitation of available time, collection of the milk was most convenient if done on Sunday, so that extraction could be begun Monday, and completed on Wednesday. Samples earlier than the fifth or sixth day postpartum were difficult to handle because of the ether-soluble constituents of colostrum, and it was not unusual to find that practically no milk could be expressed on the ninth to twelfth days. The patient mentioned earlier, whose milk gave a negative test after 14 cigarettes, secreted but 35 c.c. during the eleventh day postpartum, but she was a particularly excitable individual, and her nervous instability probably was the major factor in her inefficient breast function. Hatcher and Crosby's subject had had an abundant output at first which dwindled rapidly to less than an ounce per nursing on the eighth day. One is sorely tempted to conclude that excessive smoking does influence milk production adversely.

Limitation of smoking purely upon the number of cigarettes consumed daily can have but little value. Some individuals toss a cigarette aside when but a third is burned; others, not until the stub can scarcely be manipulated. Bogen<sup>17</sup> has shown that rapid smoking causes complete disappearance of nicotine from the smoke at the burning end of the cigarette, and, consequently, almost the entire nicotine content of the tobacco is drawn into the mouth. Absorption of the nicotine is much greater if the smoke is inhaled rather than being expelled from the mouth. The nicotine content<sup>18</sup> of the tobaccos varies widely, so that one must consider the brand used. These and other factors make it extremely difficult to formulate safe and sane standards.

Among primitive peoples a woman either nursed her young or it died. In this manner, if one may use a dairyman's terminology, only the heavy-milking strains were continued, and the light-milking strains were bred out. With the solving of most of the problems of artificial feeding of infants, the absolute necessity for adequate lactation has been abolished, and an increasing number of women refuse the burden and inconvenience of producing food that can be secured from cows and laboratories. It is not my belief that the effect of nicotine is the sole or even the chief factor involved in diminished lactation. Nothing will much more rapidly reduce milk production than hysteria. Usually it is the nervous, excitable woman who smokes; and usually it is the nervous, excitable woman, who, whether a smoker or an abstainer, has a deficient milk output. The two traits, however, are so frequently noted in the same woman that it is easy to draw conclusions which may be erroneous.

## SUMMARY

The elimination of nicotine by lactating breasts, confirmed by biologic tests, has again been demonstrated. From a review of available literature and from personal observation, it would appear that smoking in moderation probably is a minor factor in influencing lactation. While excessive smoking and adequate lactation usually are not noted in the same individual, as yet there is insufficient evidence to conclude that the one is the cause, the other the effect. Due to possible, unproved effects upon the digestive processes of the infant, excessive smoking should be forbidden the nursing mother. The impression, frequently recorded, that women who smoke usually do so to excess would seem to be as inaccurate as impressions generally are.

I am greatly indebted to various colleagues for permission to obtain milk samples from their patients; to the nurses of the Obstetrical Departments of the Hollywood and Cedars of Lebanon Hospitals; and especially to Dr. C. H. Thienes, Professor of Pharmacology, without whose counsel and cooperation this work would not have been done.

## REFERENCES

- (1) *Hatcher, R. A., and Crosby, H.*: J. Pharmacol. & Exper. Therap. 32: 1, 1927. (2) *Emanuel, W.*: Ztschr. f. Kinderh. 52: 41, 1931. (3) *Cushny, A. R.*: A Text-Book of Pharmacology and Therapeutics, ed. 9, Revised by Edmunds, C. W., and Gunn, J. A., 1928, Lea & Febiger, p. 325. (4) *Arcy, L. B.*: Developmental Anatomy, ed. 2, 1930, Philadelphia, W. B. Saunders Co., p. 341. (5) *Chase, R. E.*: Am. J. Physiol. 81: 469, 1927. (6) *Chase, R. E.*: Am. J. Physiol. 85: 527, 1928. (7) *Hunter, J. E., and Haley, D. E.*: Poultry Science 10: 61, 1931. (8) *Diehl, H. S.*: Minn. Med. 12: 424, 1929. (9) *Richon, L., and Perrin, M.*: Compt. rend. Soc. de Biol. 64: 563, 1908. (10) *Dixon, W. E., and Lee, W. E.*: Quart. J. Exper. Physiol. 5: 373, 1912. (11) *Thienes, C. H.*: Am. J. Hyg. 9: 500, 1929. (12) *Behrend, A., and Thienes, C. H.*: J. Pharmacol. & Exper. Therap. 46: 113, 1932. (13) *Chiasson, M. J.*, Quoted by *Johnson, W. M.*: J. A. M. A. 93: 1909, 1929. (14) *Mgalobeli, M.*: Monatschr. f. Geburtsh. u. Gynäk. 88: 237, 1931. (15) *Sajous, C. E. de M., and L. T. de M.*: Analytic Cyclopedia of Practical Medicine, ed. 10, Philadelphia, 1927, F. A. Davis Co. 8: p. 563. (16) *Greenhill, J. C.*: Obst. & Gynec. p. 342, 1931. (17) *Bogen, Emil*: J. A. M. A. 93: 1110, 1929. (18) *Connecticut Agricultural Experimental Station Bulletin* 307.

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## THE TREATMENT OF PROLAPSUS UTERI, WITH SPECIAL REFERENCE TO THE MANCHESTER OPERATION OF COLPORRHAPHY\*

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IT WOULD seem almost necessary to apologize for writing another article upon such a well-worn subject as the treatment of uterine prolapse, but the very fact that so much is still written about the treatment of a condition well described by Galen, is proof that no one method has been universally accepted as a cure of all cases.

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In some centers various forms of vaginal operation are performed, in others some form of abdominal operation, in others a combination of vaginal and abdominal operations, while in others again several types of operation are used, each being specially reserved for patients of a certain age, parity, or social position.

My excuse for writing another article is that in Manchester for a continuous period of forty-five years one type of operation, always with the same general principles though with varying minor technical details, has been performed by a large number of gynecologists, upon all patients with prolapsus uteri, irrespective of age, social position, or parity, and that the results allow more nearly a guarantee of cure to be given to the patient beforehand than does any other operation performed in surgery.

Marshall Hall of London seems to have been the first to suggest narrowing of the vagina, but there is no record that he performed the operation himself.

Heming in 1831 operated upon the anterior vaginal wall and was followed by Kilian, Marion Sims, Emmett, Savage, Aveling, Morton and Gaillard, Thomas, etc., all with various modifications and each claiming fairly good results.

Now when operations are more or less standardized so that it is necessary to quote large numbers to prove that one method is superior to another, it is only by reading the records of these earlier operators, written by themselves, that we can in any way realize the amount of original thought, manual dexterity and self-confidence which each advancing step required.

Marion Sims' description of his first anterior colporrhaphy is a striking illustration as, in order to cure the prolapse, he was quite prepared to risk the production of a large vesicovaginal fistula and to trust to his own ability to close this at a later stage. By sheer good luck this was avoided and an operation devised which could be performed by disciples with less skill and confidence.

Operations upon the posterior vaginal wall and perineum were performed by Hegar, Simon, Emmett, Martin, etc., and the cervix was amputated by Huguier, Coupil, Sims, etc., but no one seems to have combined these three operations until some members of the Staff of the Women's Hospital attached to the University of Berlin and Donald of Manchester independently began to do so in 1888.

Marion Sims, in the 1886 edition of his celebrated book, states that for the treatment of prolapsus uteri there are three surgical processes from which to choose. (1) Amputation of the cervix, (2) perineal operations, or (3) narrowing the vagina by the trowel or triangular-shaped denudation of its anterior wall as performed by Emmett and himself; while the 1890 edition of Hart and Barbour contains this statement about perineorrhaphy, "These operations help, at least, by enabling the patient to wear a ring pessary"; and that apparently was the object for which the operation was performed.

In 1888, Cohen<sup>1</sup> published the results of 105 cases of prolapsus uteri treated by colporrhaphy by Olshausen and Carl Schröder. In some of these cases only anterior, in others only posterior colporrhaphy was performed, but in a few these two operations were combined. Of the whole series he claimed 56 per cent of cures, but he had two fatal cases.

In this same year (1888) my old chief, Donald of Manchester, commenced, quite independently, to treat these cases by the combined operation of anterior and posterior colporrhaphy and amputation of the cervix.

Manchester, the center of a large industrial area in which much female labor is employed, has more than its fair share of cases of prolapsus and Donald, while the Senior Resident at St. Mary's Hospital, had been much impressed by the failure of plastic surgery to cure these cases; in fact the prevailing opinion of the Staff at that time was that these cases were incurable, and that the very best result which could be hoped for was sufficient narrowing of the vagina to allow of the retention of a pessary.

A study of these failures convinced Donald that success could only be attained when the narrowing of the vagina was obtained by suturing the deep structures as well as the superficial, and that some absorbable suture material was required for this purpose.

Donald's first two operations were performed on April 28 and July 18, 1888, silver wire being used as the suturing material as was the common practice at that time.

About this time he heard that in Germany a new absorbable suture material, catgut, was being tried in general surgical work and having obtained some, sterilized in carbolic oil, he performed his third operation on Aug. 3, 1888. In this case he did an anterior colporrhaphy with a wide diamond-shaped incision, and drew the deep tissues together with a buried spiral suture of catgut. A fortnight later a posterior colporrhaphy was performed and the deep tissues, as in the anterior colporrhaphy, closed with buried catgut. On August 30 the patient was discharged, and to quote from the notes "the wound was healed and the outlet of the vagina only admitted two fingers with difficulty. No pessary was inserted."

Two other patients were operated upon in that year, making 5 in all, the same number in 1889, 6 in 1890, and only 3 in 1891, but the results were obviously improving, and he was gradually becoming convinced that this operation could be used as a cure and not merely as a means to retain a pessary, as there is a note to each of the cases in 1891 that the patient went home without a pessary, whereas in previous years this note was only added to one case in each year.

In all these cases anterior and posterior colporrhaphy were combined, and in a large number the cervix also was amputated.

From this time onward, Donald had established his routine procedure for the treatment of prolapsus uteri, anterior and posterior colporrhaphy with amputation of the cervix, and the suturing of the deep muscular tissue with buried catgut. This operation he performed upon all patients with this condition, irrespective of age or parity, and so good were his results that his colleagues gradually

adopted his procedure, and when I first became his House Surgeon in 1904, every member of the Staff had followed his lead and it was some years before I saw a case treated in any other way.

Donald, I am glad to say, is still with us in active work, but many of his colleagues have fallen by the way, and so there have been a considerable number of gynecologists on the Staff of St. Mary's Hospital during the succeeding forty-five years, but, with the exception of two, all have adopted this method of treatment of uterine prolapse, modified in detail, but with the same essential principles, and it is doubtful whether any other center can show such a long continuous method of treatment for this common complaint by such a large group of operators.

At a later period Fothergill<sup>2, 3, 4</sup> modified the operation by making the incision of the anterior colporrhaphy triangular in shape, with a wide base near the cervix and by a circular incision round the cervix he combined the amputation of this organ with the anterior colporrhaphy. This was only a technical modification of Donald's original operation, but it had the advantage of exposing more widely the important tissue at the base of each broad ligament, and removed the bridge of vaginal tissue left between the cervical sutures and the anterior colporrhaphy when the former is removed by the classical Schröder's amputation before the anterior colporrhaphy region is denuded.

Unfortunately, Donald did not publish until many years later<sup>5</sup> a description or results of his operation: it was accepted by his colleagues and later by all his pupils; many visitors saw him perform the operation and the results were so excellent that he took it for granted that all would adopt it. It is in the wide publication of Fothergill's papers that the gynecologic world has heard the details of this operation, and through him that it has been adopted as the routine treatment in many centers.

#### ETIOLOGY

The uterus is described as having eight ligaments, but it has long been recognized that these are of no importance in maintaining the position of the uterus, which depends entirely upon the tone of the pelvic floor. This plane of muscular and connective tissue stretches across the pelvis in well-defined bundles, many of which are inserted into the uterus about the level of the internal os. The strongest portion of this tissue forms a thick bundle which runs at the base of each broad ligament a little below the uterine artery, but other important fibers run backward from the cervix to the sacrum and forward to the pubic arch, and on a lower plane these are connected with the levator ani and other muscles of the pelvis.

That these muscles are responsible for the support of the uterus is seen every time the operation of hysterectomy is performed. If the uterus is firmly grasped and pulled upward, no additional mobility is given when the broad ligaments are cut and the bladder separated from the cervix, but as soon as the tissue immediately below the uterine artery and that at the base of the uterosacral ligaments is cut, the uterus can be drawn from the pelvis a considerable distance. It is this tissue then which suspends the uterus in the pelvis, and it is only possible for the uterus to descend if this tissue is overstretched, torn, or otherwise weakened.

This tissue has been long recognized by the anatomists, but it was I think Fothergill's racily written paper in 1908<sup>b</sup> which called wide attention to this fact; certainly this was so in my country, and I am taking it for granted that this is now accepted by all gynecologists.

Weakness of the pelvic floor then is an essential condition in uterine prolapse, but there are many secondary causes which increase the degree and the rapidity of its occurrence, such as increased intra-abdominal pressure from tumors or chronic coughing or heavy work, increased weight of the uterus with fibroids or subinvolution, or a heavy cervix due to a fibroid or chronic cervicitis, and one or more of these secondary factors is commonly present in each case.

Parturition is the common cause of a weak pelvic floor and so the majority of these patients with prolapsus uteri are parous women, but it does occur in virgins, though much more rarely. In these patients there is some developmental weakness of the pelvic floor, but in addition to this, there is generally some secondary cause, and this accounts for the fact that these cases of prolapse in virgins occur chiefly in the industrial North where such a large number of women do heavy work in the mills.

#### SYMPTOMS

The most common symptom is the sensation of "something coming down," but before this stage is reached a considerable number of patients suffer from aching, dragging pain in the lower part of the abdomen and the back when standing or undertaking physical work. In these cases the laxity of the pelvic floor is still of slight degree, but enough to allow the uterus to prolapse when the patient undertakes heavy work, and in this way to drag upon supports which normally should be quite free.

In all cases in which the patient complains of this aching pain in the back or lower abdomen when standing or working, the pelvic floor should be carefully investigated and if this is found to be unduly lax, a well-designed colporrhaphy will usually cure this symptom.

In cases in which there is damage to the muscular fibers running from the cervix to the pubic arch, cystocele is produced and the pa-

tient frequently complains of incontinence of urine, especially when she strains.

#### TREATMENT

Up to the end of last century the common treatment for these cases was the insertion of some form of pessary, which the patient was condemned to wear for the rest of her life, and unfortunately even now some members of our profession do not seem to realize that this condition is curable, and they still persist in the use of these insanitary, inefficient instruments. Often no doubt they are influenced by the fact that the patient objects to an operation, and when they find that an instrument makes her comfortable, they leave it at that. What they do not realize is that some years later, when the pelvic muscles atrophy, there is a strong possibility that this instrument will fail to keep the patient comfortable, and when she is sixty or seventy years of age, she may find herself so uncomfortable that she will then demand an operation which could have been performed many years before, when she was more able to stand the strain and thus have avoided this long use of these disagreeable instruments.

Every year I operate upon a considerable number of women over sixty, and a few over seventy years of age. On several occasions I have been asked to operate upon women over eighty years of age, who were completely bedridden with a condition which should have been cured many years previously: in each of these cases I have found the patient's condition so enfeebled that operation was then out of the question, but one of my colleagues has successfully performed the operation upon a patient eighty-five years of age.

The only type of patient in whom it is justifiable to use a pessary is the young woman who still hopes to have more children. In these cases a pessary can be used if it makes her comfortable, though a colporrhaphy should be done as soon as her family is completed. Many of these patients dislike the use of pessaries and prefer to have a colporrhaphy performed, even though there is some risk of a recurrence in subsequent labors, a risk, as I shall show later, of less than 25 per cent.

Many operations have been devised and are still used for the treatment of this condition, and these may be classified into five groups: (1) Some form of hysterectomy. (2) Some form of abdominal uterine fixation. (3) Some form of vaginal interposition operation. (4) Le Fort's operation. (5) Colporrhaphy.

Hysterectomy as a cure for prolapse is useless and the very worst type of prolapse is the one which occurs after hysterectomy has been performed.

If great care is taken to close the gap in the pelvic floor by stitching together the muscle bundles which were inserted into the uterus, a

vaginal hysterectomy can easily be performed along with the colporrhaphy, but this is done merely because the hysterectomy has to be performed and can be easily combined with an anterior colporrhaphy, and it is not done as a cure for the prolapse.

Abdominal uterine fixation is still done in many schools but by itself it is quite useless. Combined with the colporrhaphy it is very seldom required, and only in those cases where the musculature of the pelvic floor is so deficient that it is incapable of supporting the uterus even when it is shortened and strengthened to the fullest extent.

Of vaginal interposition operations I have no experience. They must be performed only in those patients who are past the menopause or combined with some method of sterilization.

This means that the majority of the patients are elderly and less well able to stand a severe operation, and if Frankl's statement in a recent article is correct that "a carefully performed operation for an extensive prolapse requires for its performance ninety or more minutes" it cannot compare with a colporrhaphy which takes only thirty minutes.

Le Fort's operation was a very ingenious device, and I understand it was successful in many cases, though it had obvious objections, and I am doubtful if this operation is now ever performed.

Our last group is colporrhaphy, and if we agree that the primary cause of the prolapse is a weakness or stretching of the pelvic floor, it seems logical to treat this condition by tightening and strengthening the pelvic floor as only a properly performed colporrhaphy can do.

#### TECHNIC OF THE OPERATION

In this description of the operation I follow in detail my own method of performing it, which in general principles is the method I learned from my old teacher, Dr. Donald, modified in some details by the late Dr. W. E. Fothergill, and again in a few details by myself.

The patient is placed on the table in the lithotomy position, the vulva shaved, and this and the vagina thoroughly cleansed with soap and water and then with surgical spirit and a solution of iodine. The cervix is then grasped with the vulsellum and the canal dilated. This dilatation is necessary, as at a later stage sutures have to be inserted through the cervical mucosa. In practice, I always curette the uterus, to make quite sure that there is nothing abnormal in its interior.

I think the shortest and clearest method of description will be to follow the illustrations.

Fig. 1 shows the method of stitching back the labia minora. A sterile towel with an opening somewhat larger than the vulva is placed over the patient, a weighted speculum inserted into the vagina, and a stitch inserted through the towel and subjacent skin of the buttock and then through the labium minus. When this is done on both sides, the labia are drawn well away from the vagina and so give a good view of the field of operation, and present a smooth surface which is more easily sterilized. This illustration shows the left labium minus stitched to the buttock.



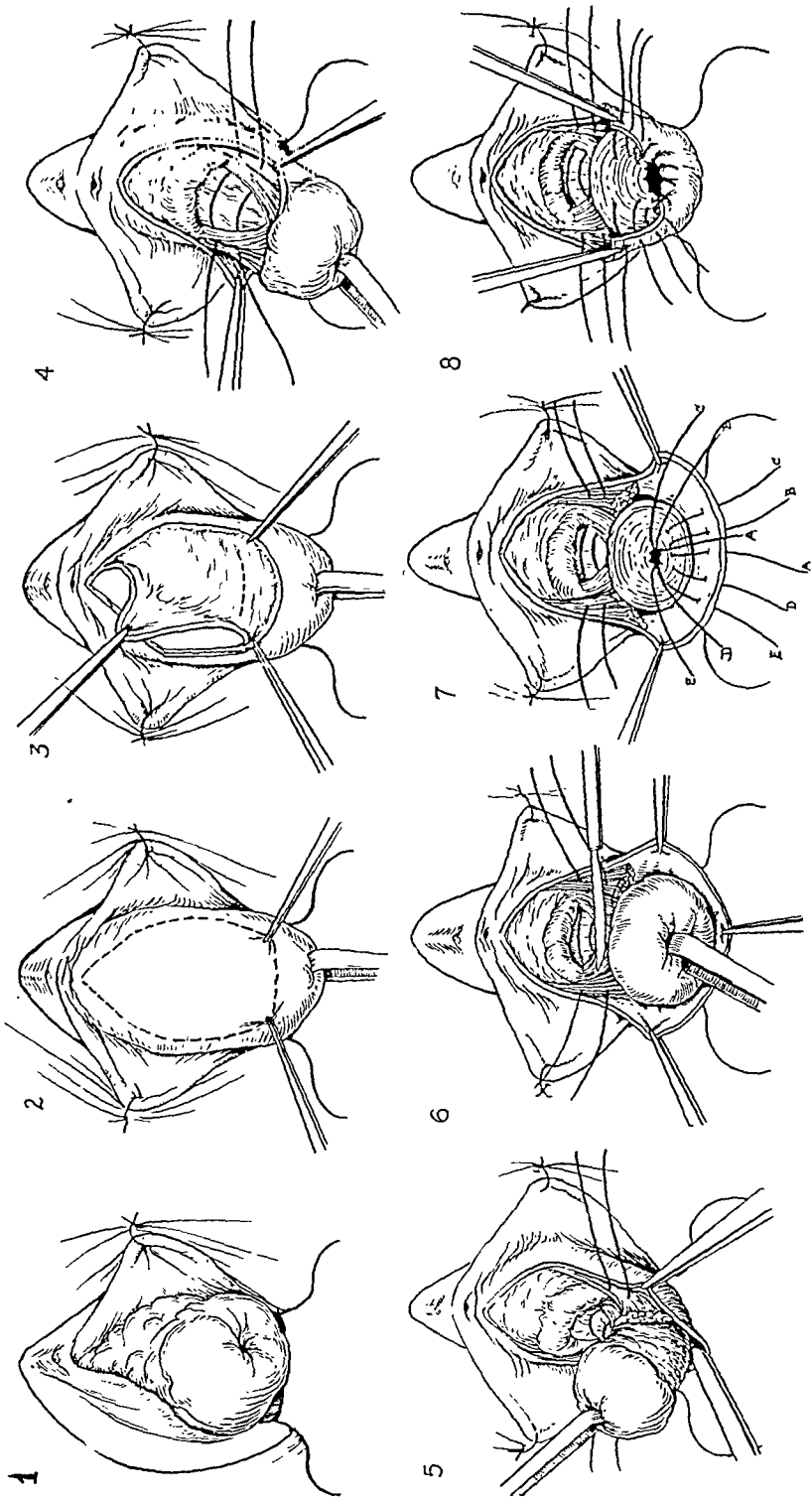


Fig. 2 shows both labia minora stitched outwards. The cervix is grasped with a vulsellum, pulled downward as far as possible, dilated, and the uterus everted. A pair of Spencer Wells now grasps the vaginal mucosa on each side of the cervix, as far apart as it is judged necessary to make the base of the denuded area. This is a matter of experience, and can only be judged correctly with practice. A triangular area is then marked out with the scalpel with its base near the cervix and its apex below the urethra, but the sides of the triangle are not quite straight as it is necessary to have the denuded area a little wider in the center of the vagina than at the base.

In a complete procidentia it is possible to mark out the whole triangle before separating any of the mucosa, but in cases of partial prolapse it is best to first mark out the lower portion and dissect this from the subjacent tissues: during this process the folds in the remaining portion of the vagina are smoothed out, and the outline of the triangle can be more easily completed. In practice, the base of the triangle is usually made somewhat wider than this drawing.

Fig. 3 shows the dissection of the vaginal mucosa from below upward. In a case of complete procidentia it is possible to commence the dissection from the urethra downward, but in cases of partial prolapse it is much easier to commence at the base of the triangle near the cervix, and so I prefer to make this a routine practice in all cases.

Fig. 4 shows the triangular area denuded of mucous membrane. The few fibers of muscle and connective tissue which fix the bladder to the cervix have been cut and this organ has been dissected up from the cervix. This exposes the muscular tissue at the base of each broad ligament, and with a needle it is possible to encircle a mass of this tissue on each side. This sketch shows two sutures inserted, each of which includes a portion of this tissue on both sides. When these sutures are tied, this tissue from each side will be drawn to the front of the cervix, and therefore this portion of the pelvic floor will be shortened by this amount. The ligatures are not tied at this stage, but it is convenient to insert them while the tissues are visible.

In the majority of cases, the suturing of this material in front of the cervix is sufficient to keep the uterus anteфлекed, even though it was previously retroфлекed, but in a few cases where the uterus is very heavy these sutures transfix a small portion of the anterior wall of the uterus, and so keep this organ in the anteфлекed position while the healing process takes place.

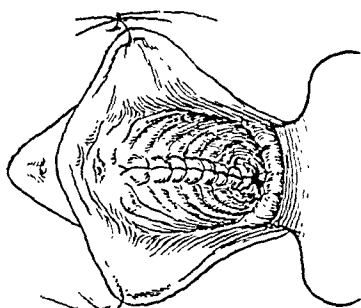
Fig. 5: The cervix is drawn forward to show part of the posterior surface. An incision is made through the vaginal mucosa from one pair of Spencer Wells round the back of the cervix to the pair of Spencer Wells on the other side, and the mucosa is stripped from the cervix for a distance varying with the amount of cervix which requires amputation.

Fig. 6: The cervix is still grasped with the vulsellum. The vaginal mucosa has been dissected from the cervix and the scalpel is shown in position, ready to amputate the denuded portion of the cervix.

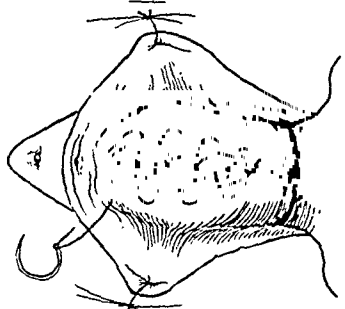
Fig. 7: A portion of the cervix has been amputated. Sutures are now inserted through the cervix and the vaginal mucosa, and when these are tied the edge of the vaginal tissue will be brought into contact with the cervical mucosa.

Fig. 8: This is a later stage with a few of the sutures tied. Finally a suture is passed through one angle of the mucosa, transfixes the center of the anterior wall of the cervix and finally the other angle of the mucosa, and when these and a few intermediate sutures are tied the external os is completed.

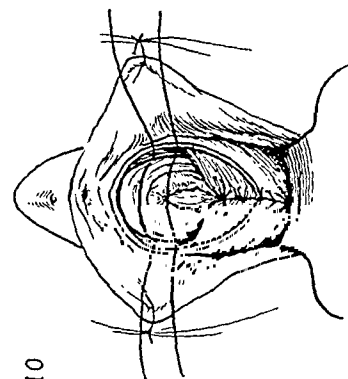
Fig. 9: This shows the external os completed. Instead of a triangle, the denuded area is now of an oval shape, as the angles at the base have been brought together at the center of the external os. By means of a continuous suture, the cut edges



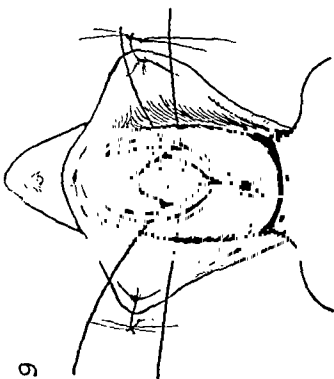
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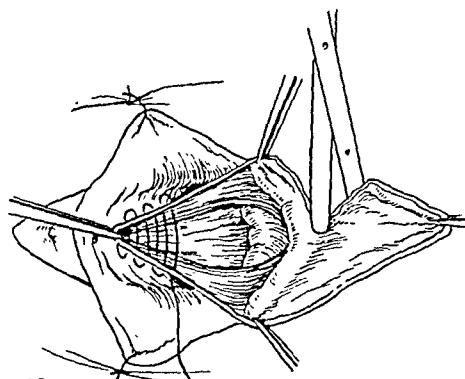
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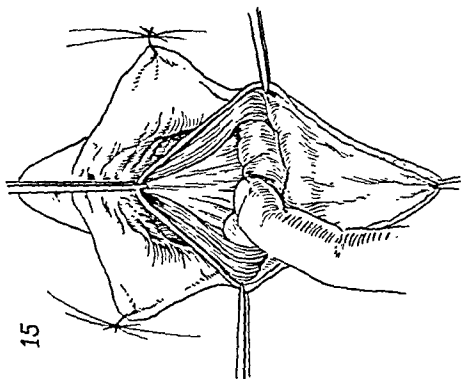
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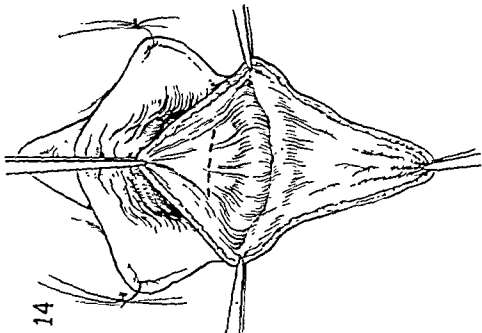
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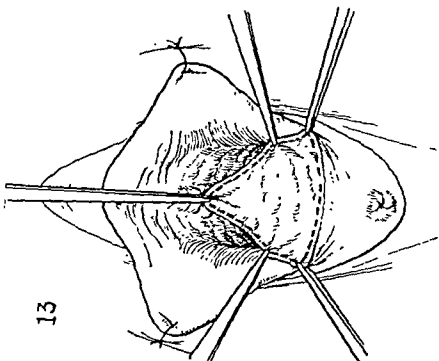
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of the mucosa are brought together up to the level of the insertion of the two deep sutures. At this stage the uterus should be examined, and if it is retroflexed the body should be replaced. The two deep sutures which in Fig. 4 are placed around the musculature at the base of each broad ligament can now be tied, and if a ligature has been left on the cervix it will be found that no reasonable amount of traction will now pull the cervix down, as the deep sutures shortening and tightening this part of the pelvic floor prevent any further descent of this organ.

Fig. 10 shows the two deep sutures tied and others inserted in the deep muscles at the base of the bladder. These additional sutures should always be inserted, and are especially important in those cases in which the patient suffers from incontinence of urine.

Fig. 11 shows these deep sutures tied and a continuous suture inserted in the vaginal mucosa to complete the closure of the original incision.

Fig. 12 shows the completion of this stage of the operation.

Fig. 13 shows the method of marking out the flaps of the posterior colporrhaphy. The redundant tissue in the posterior fornix near the cervix is grasped by a pair of forceps, and when this is pulled forward the tissue falls roughly into a triangle, with its base on the perineum, but it is usually necessary to make the center of the triangle as wide or almost as wide as the base, and this portion is marked out on each side by a pair of forceps, while the angle on the perineum is marked on each side with another pair. In practice, it is easier to denude the triangle down to the middle forceps and to control bleeding by stitching these edges together before completing the triangle down to the perineum.

Fig. 14: This shows a triangle of vaginal mucosa dissected from the subjacent tissue. It also indicates the line of the rectum with some fine fibers of connective tissue attaching it to the vagina. The dots indicate the line through which these adhesions are incised.

Fig. 15: The attachments of the rectum have been cut, and the rectum itself separated from the vaginal wall. This is the most important step in the operation, as without it, it is impossible to fill in the space between the vagina and the rectum with muscle, and if this is not done the vaginal mucosa will stretch and will bring forward the rectum as a recurrent rectocele.

Fig. 16 shows the continuous suture drawing together the upper edges of the triangle, and in practice this is usually completed before the remainder of the triangle is dissected away. This sketch shows the completion of this dissection with a pair of scissors cutting away the mucosa from the perineum. It also shows the rectum separated from the vagina, and on each side folds of muscular tissue which must be brought together by means of deep sutures. If the posterior colporrhaphy is carried sufficiently high the upper portion of this muscular tissue is part of the pelvic floor running at the base of the uterosacral ligaments and the tissue a little lower represents the levator ani muscles. The most important part of the posterior colporrhaphy is the suturing together of these deep layers of muscular tissue.

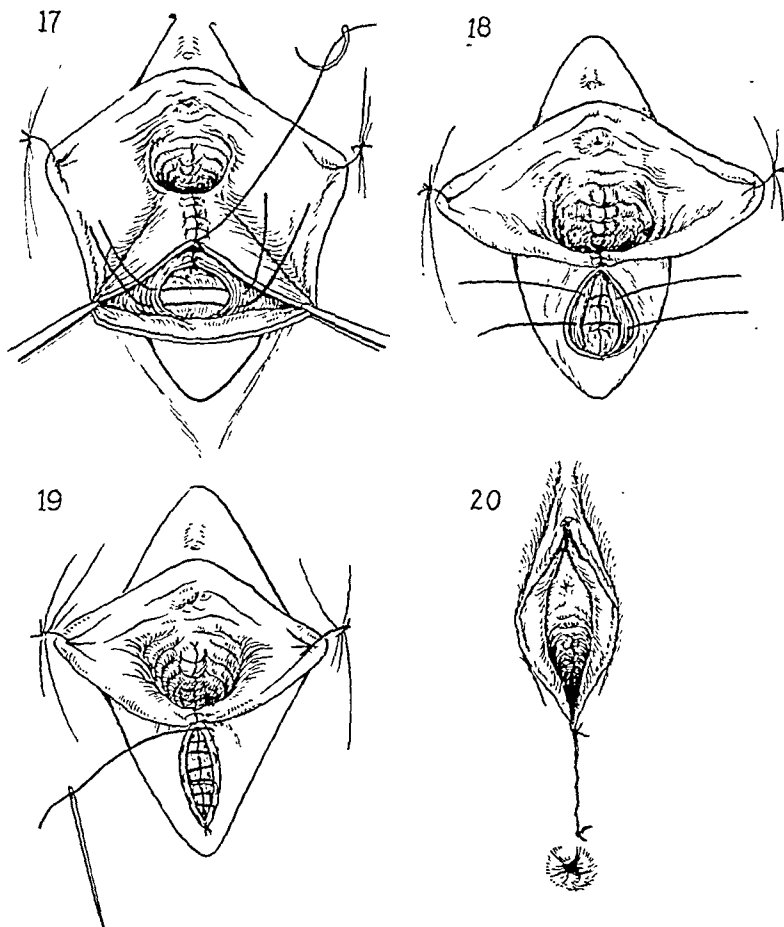
Fig. 17 shows the upper portion of the edges of the triangle drawn together by a continuous suture. It also shows a few sutures inserted into the deep muscles. In the central area the rectum can still be seen but this space will now be closed by other deep sutures inserted into the muscle.

Fig. 18 shows the completion of the suturing of the long sides of the triangle. The angles at the base of this triangle are brought together at what will be the center of the new vulval outlet. As the vaginal edges are sutured, successive layers of deep muscle are folded together, and these are bound firmly together by means of deep sutures, usually in three different layers. In this sketch, the vulval outlet is completed, one layer of sutures in the deep muscle are shown tied and another layer inserted ready for tying.

Fig. 19: The edges of the skin on the perineum are brought together by a continuous subcuticular suture. The labia minora are still sutured to the buttock.

Fig. 20 shows the completion of the operation. The sutures holding the labia minora have been cut, and the edges of the skin of the perineum brought together.

Throughout the operation, nothing but catgut is used as a suture material, and so there are no stitches to be removed during convalescence. It must be emphasized that the most important part of the operation both in the anterior and the posterior colporrhaphy is the suturing of the deep muscle, as this shortens and strengthens the whole of the pelvic floor, the tissue which alone keeps the uterus in position. The excision of the vaginal mucosa merely removes tissue which otherwise would



be redundant and gives access to the deep musculature; and the suturing of this vaginal mucosa is done only with a continuous suture and merely to promote quick healing and to control the oozing. This tissue itself is of no value in keeping the uterus in position, and if the pelvic musculature is not firmly sutured the prolapse of the uterus will quickly recur.

#### RESULTS

After 1888, when Dr. Donald first combined anterior and posterior colporrhaphy with amputation of the cervix for the cure of prolapsus uteri, he and his colleagues very soon adopted it as the standard operation for the treatment of this condition, and from that date

until now only a small percentage of cases in Manchester have been treated by any other method.

During this period there have been many changes on the Staff of the Hospital, but as each member in turn adopts this method of treatment, this is the strongest proof of the good results obtained by it.

In technical detail each operator has some slight modification, but in general principles the operation remains the same.

The method I have described above is the one which I use myself. It is somewhat modified from that used by Dr. Donald and the one described by Dr. Fothergill, and probably none of my colleagues will describe the operation in exactly the same way, but essentially these are all the same, and there is very little difference in the results obtained by any of us.

In 1921<sup>4</sup> the late W. E. Fothergill published the results obtained in 156 cases. These showed 97 per cent free from recurrence, and of the 4 patients who showed some recurrence, two had had children since the operation. At the same meeting my colleague, Dr. F. H. Lacey,<sup>5</sup> reported the results obtained in 521 patients operated upon by members of the Staff of St. Mary's Hospital, Manchester.

Of these, 87 per cent of the patients reported that they were cured, but this percentage is really much too low, as a large number of those whose replies were unsatisfactory failed to come for further examination, and so were included as failures, whereas of those who did come for examination, a large percentage had no prolapse and were complaining of symptoms not connected with this condition. In many other cases there were special reasons for the recurrence, so that the correct percentage of nonrecurrences was much higher than 87 per cent.

In 1930<sup>6</sup> I published the results which I had obtained in 293 patients operated upon at least three years prior to the date of the investigation, and for the purpose of this paper I have attempted to follow up my patients for the next three years, 1927, 1928 and 1929, all of which again have been operated upon for a longer period than three years, and in this paper I am adding the results of these two investigations.

Unfortunately in our country we have no "follow-up" system in our hospitals, and whenever we desire to investigate the results of a large series of cases, we find it impossible to make this a really consecutive series, as so many patients have left their old homes and cannot be traced. This is especially so where a long interval has elapsed since the operation, as must be the case after colporrhaphy, as recurrence necessarily takes some time, and results calculated from patients operated upon at a recent date will be too good. In this series at least three years has elapsed since the operation in each case.

In this new series, though every endeavor has been made to trace the patients through their friends and doctors, I have only been able to obtain replies from 256 out of 324 to whom a questionnaire was sent.

With a condition like prolapsus uteri, where a good result means freedom from symptoms to the patient, I have counted as a cure all those cases in which the patient has filled up the questionnaire to say that she is quite free from symptoms of "bearing down." Those whose replies are not quite satisfactory I have personally investigated, as I find that many of these, especially hospital patients, report numerous complaints which have no connection with their pelvic organs. I am including in the failures those in which there is the slightest degree of recurrence or redundancy of the vaginal tissues and also those whose replies are not quite satisfactory but who have failed to report for further investigation. Probably these would be found to be suffering from some other condition, but as I have not been able to examine these patients, it seems fairer to include them in the failures.

In these two series combined, I have replies from 549 patients, and this is the figure from which I have calculated my percentages in the following paragraphs.

*Prolapse of Uterus or Vaginal Walls.*—In this combined series of 549 cases the results are:

Completely cured	529, or 96.35 per cent
Unsatisfactory	20, or 3.64 per cent

Of those whose results are not satisfactory, 5 had subsequently borne children, and the parturition is most probably the cause of the recurrence; 4 failed to come for further examination and so are recorded as failures; one had a definite hernia through the vaginal scar as recorded later; and 8 showed some laxity only of the posterior fornix, a condition which is discussed below.

Apart from those who had subsequently borne children, only 4 had symptoms sufficiently severe to warrant any further operative treatment (0.75 per cent).

*Mortality.*—One of the great advantages of this operation is the very slight risk to the patient. In the six years included in this investigation not a single death occurred.

In the twenty-six years during which I have performed this operation, I can find in my hospital and private records only 9 deaths, one from pneumonia, one from heart failure, one from embolism, one from septic absorption from a piece of gauze retained in the uterus, one from pyelitis due to operating too soon after an attack of cystitis, and in 4 the cause of death was not noted in the records.

Two of these deaths could have been avoided, and in each case I learned a practical lesson. In one of these, a very early one, I operated in the patient's house, and following my usual custom up to that time I packed some gauze into the uterus and around the cervix and asked the patient's own doctor to remove this on the following day. A week later I was asked to see her again and found her dying from septic absorption, due to a piece of gauze retained in the uterus, which had broken off when the doctor had removed the gauze the day after the operation. Since then, I have never packed the uterus. The death from pyelitis also taught me a lesson

and since then I have been very careful not to operate upon a patient with any signs of cystitis.

During these twenty-six years I have records of 2152 cases upon whom I have performed the operation, and so the mortality is only 0.37 per cent.

*Chronic Pain.*—Chronic aching pain in the lower abdomen and back is one of the most troublesome complaints which we are called upon to deal with, as it may be due to so many different conditions. One of these is the early stage of prolapsus uteri, where the pelvic floor has been stretched so that when the patient stands for any length of time or undertakes heavy work the uterus is driven down for a certain distance, and she complains of chronic pain long before she is aware that there is any definite bearing-down. Every patient who comes to us with this symptom should be carefully examined to see whether she has an early stage of prolapsus uteri, and if this is found, its cure by a colporrhaphy will probably cure her pain.

In this series, I find that 56 patients definitely complained of chronic aching pain, and of these 49 were cured, 87.5 per cent, and 7 not cured, 12.5 per cent.

*Incontinence of Urine.*—In this series there were 17 patients who complained of incontinence of urine on straining, and of these three were not cured.

This is a large percentage of failure for this particular symptom, but it is only what might be expected, as it is often impossible to find a satisfactory amount of muscle at the base of the bladder and urethra, and even when this is found and brought together by deep sutures, it is a tissue which seems specially prone to re-stretch.

*Subsequent Parturition.*—When a patient is advised to have this operation, knowing that it was produced in the first instance by parturition, she frequently asks this question, "Will it recur if I have other children?"

As the operation replaces the pelvic muscles as nearly as possible into their original condition, it follows that there is considerable risk of recurrence, and as a result, there is a tendency for us to defer this operation until the patient has reached an age when she is not likely to have more children, or when she has made up her mind that she has as many as she desires. Consequently it is impossible to collect a long series of cases in which labor has occurred after a colporrhaphy has been performed.

In this combined series, I find that only 27 had children after the operation, and this is a very small number in which to calculate percentages, but of this number only five showed any signs of recurrence, that is, 18.5 per cent, and I am doubtful whether a series of primiparas would show any greater freedom.

If a patient does become pregnant after a colporrhaphy has been performed, care must be taken during parturition to give the soft parts ample time to dilate, and if this is done the chances of recurrence are comparatively small.

What is perhaps of more importance is whether succeeding labors will be more difficult. One early argument against this operation was that the scarring of the cervix would produce great delay in the first stage. In practice this has proved to be wrong. It may be that in an odd case there is some trouble, but of the patients whom we have subsequently admitted to St. Mary's Hospital for confinement, we have not had any trouble, nor have I had any complaint from any practitioner who has subsequently attended any of my patients. In fact, in many of the cases the first stage is definitely shortened, due to the fact that there is a smaller amount of cervical tissue to dilate, and as illustrating this I give the notes of a case which was recently under my own direct care.

This patient in her early twenties had two children, both very small, and each time long protracted labors, of about thirty-six hours. Evidently great delay in the first stage, and final delivery with forceps.



Subsequently I did a colporrhaphy for prolapsus uteri, and a little later her husband died. For ten years she remained in widowhood and then remarried and became pregnant. The vagina was fairly narrow, she was forty years of age, and the new husband was a big man, and consequently I was prepared for trouble at the confinement, and it was arranged that she should come into my Nursing Home.

Labor, however, commenced a few days before the calculated date, and as there was a thick fog that night and the patient lived 70 miles away, it was impossible either for her to come into my Home or for me to go to her, and I advised her doctor to give her sedatives, and we would decide the next morning whether to move her or not. By breakfast time the next morning, eight hours after the first labor pain, she delivered herself without aid of a large healthy son.

Of these 27 cases in this series who subsequently had children, one is described as having a long labor, and all the others quite normal.

*Results After the Menopause.*—The results of this operation are equally good whatever the age of the patient, and in this series are included patients ranging from sixteen to seventy-five years of age.

Many young or middle-aged patients with this condition can be made quite comfortable with pessaries, but when the menopause is reached, progressive atrophy of muscle occurs and these patients, who up to now have been fairly comfortable, gradually find that they require larger and larger pessaries, and that finally a stage is reached when no instrument will make them comfortable, consequently we are called upon to operate upon a large number of patients over sixty and even over seventy, and one of my colleagues has operated upon a patient of eighty-five years of age.

In some centers an interposition operation is advised, in others it is thought necessary to open the abdomen and fix the uterus to the abdominal wall. In our experience this operation of colporrhaphy does equally well after the menopause as in other stages of life, and we make no difference in the type of operation employed, whatever may be the age of the patient.

In this series there were 171 patients over fifty years of age with the following results: cured, 167, 97.72 per cent, and not cured, 4, 2.3 per cent. Even these four recurrences are very slight, the patients are all very much better and in no instance is the trouble sufficient to warrant the patient having any further operation. In three instances there is only a little laxity of the posterior fornix, and in the fourth a slight degree of cystocele, with a slight return of the incontinence of urine on straining.

In these series there were 5 patients aged respectively 70, 70, 71, 73, and 75 years, all of whom were cured. One of these at seventy-three years of age reports that she does all her own work, and can walk for miles.

*Prolapse in Nulliparas.*—The commonest cause of prolapse is weakness of the pelvic floor, produced by stretching and tearing during parturition, but a small percentage of cases occur in women who have not had any children, many of whom are virgins.

In these cases, there is a developmental weakness of the pelvic muscles, and in addition the patient has usually undertaken heavy work which necessitates increased intraabdominal pressure and so the uterus is driven down. This accounts for the fact that we see this type of case not infrequently in the industrial North, whereas it is extremely rare in the South of England.

It might be expected that this type of case would give a worse result, as the primary cause is a weakness or deficiency of the pelvic musculature, whereas in the parous patients the musculature was presumably normal in the first instance but damaged during parturition, and as the benefit of a colporrhaphy depends upon the

rebuilding of the musculature, there must be some cases in nulliparas where it is impossible to find a sufficient amount of this structure to hold the pelvic organs in position.

In this series I obtained replies from 32 nulliparas, of whom 31 were completely cured, while only one showed any sign of recurrence, but in one of the cases so little musculature was found in the pelvic floor that a ventral fixation was done in addition to the colporrhaphy.

Two of these patients were virgins of only sixteen years of age, and three were virgins sixty-three years of age.

One virgin, now over sixty years of age, reports that she is a weaver and does a full day's work looking after three looms.

I have not tabulated these figures or reduced them to percentages, as they are too small, but they do confirm our belief that the best treatment for these cases is our usual operation of a double colporrhaphy with amputation of the cervix.

*Ventral Fixation.*—Some operators have so little trust in vaginal repair that they always combine this with some form of abdominal uterine fixation.

With a properly performed colporrhaphy in a patient with a reasonable amount of pelvic muscle, this is never necessary. Very occasionally a case is found in which there is so little pelvic muscle that it is unlikely that the colporrhaphy can build up sufficient of this tissue to hold the organs in place, and consequently there is an odd case in which an abdominal section is done in addition to the colporrhaphy.

In this series there were two such cases, in one so little muscular tissue was found at the time of the operation that a ventral fixation was done at the primary operation. The other was a very interesting case, and was an instance of that rare type where the tissues either heal so badly or are so weak that they give way with very little strain.

This patient had a colporrhaphy performed on three separate occasions, followed in each instance with recurrence. On the fourth occasion I did a colporrhaphy and also a ventral fixation. A few weeks ago she reported to me that again something was coming down in the passage. I found the anterior colporrhaphy quite sound, no sign of prolapse of the cervix even when she strained and coughed, but in the upper part of the vagina was a piece of tissue extending down to the vulva over the top of the posterior colporrhaphy, and this at first I took to be a stretched portion of the posterior fornix. When I operated upon her a few days later I found that it was a true hernia from the pouch of Douglas through the vaginal scar and consisted of a sac of vaginal tissue lined by peritoneum, containing a large appendix epiploica. I tried to close this in the usual way, but found very little vaginal muscle, and I am doubtful if there will not be some recurrence. Her abdominal scar had also given way, and was riddled with small incisional hernias.

*Lax Posterior Vaginal Wall.*—It is very difficult to tighten this part of the vagina without running some risk of leaving the vagina too narrow, and in a large number of patients who complain of some symptom after the operation it is found that the laxity is located entirely in this region, which allows a portion of the posterior fornix to fall down like a foolscap over the lower portion of the posterior colporrhaphy.

In the majority of these cases the patient is merely conscious of there being a little tissue in the vagina when she strains, and the symptoms are so slight that she does not desire any further operation, but occasionally it is sufficiently marked to warrant removal of this redundant tissue.

In this last series I investigated (1927, 1928, 1929) 9 patients are recorded as not being satisfactory. Of these one had a small cystocele, another a definite hernia through the posterior colporrhaphy scar, and the remaining 7 were all cases

of lax posterior fornix, and only one of these was sufficiently severe to warrant any further operation. In the first series there was only one failure due to this cause, and this suggests that in the last few years I have failed, quite unconsciously, to carry my posterior colporrhaphy as high as formerly.

In order to avoid this complication, I now carry my posterior colporrhaphy higher, almost to the cervix, and I am hoping that by this method and especially by suturing the deep muscles at a higher level, I shall avoid this complication in the future.

*Postoperative Treatment and Complications.*—These patients do best in institutions where the Staff commonly nurses this type of case, owing in a large measure to their training to leave well alone.

The perineum should be kept as dry as possible and after each action of the bladder and the bowels it should be swabbed with a small quantity of lotion, dried with spirit and recovered with a sterile pad.

At the end of the operation, I pack the vagina with gauze soaked in B.I.P. (a bismuth, iodoform, and paraffin mixture) as this prevents the gauze from adhering and damaging the vaginal mucosa, and this gauze is removed the following morning. On the fifth day a vaginal douche of boracic lotion is given through a glass catheter to wash away any blood clot which may have accumulated in the vagina. The bowels are moved on the third day with some aperient which will produce a soft fluid motion, the one I prefer being liquid paraffin with cascara.

*Retention of Urine.*—The majority of patients find it impossible to empty the bladder while the gauze is in the vagina, and so it is often necessary to pass a catheter on the night of the operation. The following morning when the gauze is removed, the patient is encouraged to pass urine herself, but in a few cases this is still impossible, and a catheter has to be used for another day or two, although every endeavor is made to encourage the patient to perform this act herself.

Even with the greatest care, there is considerable risk of infection of the bladder whenever a catheter is passed, and this is especially so after this operation, as the bladder has been handled and displaced and some of its blood supply damaged during the operation. If this does occur, the condition usually yields to the ordinary medicinal treatment, but in a small number of cases a chronic cystitis is established, and therefore not only should great care be exercised when a catheter is used, but any symptoms of cystitis should be treated at once and continued until all trace of infection has disappeared.

*Hemorrhage About One Week After the Operation.*—This is the greatest trouble we have to contend with, but fortunately with due care cases of serious moment are very rare.

In the majority of cases, the hemorrhage comes from the cervix, and it is due I think to a low degree of sepsis which has prevented the healing of this tissue, and so when the catgut sutures give way the cervical incision gapes and bleeds.

Very rarely the hemorrhage comes from some other portion of the incision in the vaginal walls, and I remember one case in which a vessel on the anterior wall about an inch from the urethra caused severe hemorrhage on three occasions in the same patient, and had to be ligated three times in a period of three weeks.

It is very rare for hemorrhage to commence suddenly; much more frequently there is a little bright red stain on the pad and this should act as a warning. A mild antiseptic douche should then be given to wash away any septic discharge in the vagina, and an Iodex pessary inserted, and this treatment should be repeated for three or four consecutive days. In the great majority of cases this is the only treatment which will be required. If the hemorrhage is more severe, a piece of gauze soaked in B.I.P. should be packed into the vagina. Very rarely is

it necessary to give an anesthetic and restitch the incisions, and I can remember only four occasions on which I found this necessary in my private work.

I believe the trouble often originates in a small blood clot formed from cervical oozing which becomes infected in the vagina and lying in contact with the cervix infects the cervical incision. To obviate this, I have recently returned to Professor Donald's old treatment of giving a mild antiseptic douche on the fifth day.

*Occlusion of the Cervix.*—When Fothergill first suggested circular amputation of the cervix, it was argued against in that there would frequently be so much scar tissue produced that the cervical canal would be occluded. Provided that the cervix is well dilated, this very rarely occurs. I have used this particular method of amputation for many years, and only on one occasion have I encountered this complication.

In this case, the occlusion was definitely due to slight adhesions in the canal, and the result of treatment was dramatic. At four-monthly intervals the patient had severe abdominal pain with complete amenorrhea. On the fourth occasion I was called out to see her, with strict antiseptic precautions I used a uterine sound. My intention was merely to decide whether the external os was occluded, but the adhesions were so soft that they presented no resistance to the sound, which slipped into the dilated uterus: this was followed by a rush of blood which soaked the bed and part of my garments and for a moment I feared that I had opened some important blood vessel.

*Vaginal Adhesions.*—As the incisions in the anterior and posterior vaginal walls lie in apposition, it might be expected that adhesions between these would be a common occurrence. It is, however, only in a very small percentage of cases that this does occur, and the only trouble is dyspareunia.

At one period I had a number of cases with troublesome adhesions, due I think to the fact that at this period I left in the vagina a large swab soaked in spirit, while I resterilized my hands. Apparently the vaginal tissue was damaged by the contact with the spirit for these few minutes, as since I discontinued this method I have rarely met this complication. If the patient is an elderly widow, I do not touch these adhesions, and if she is married it is usually possible to stretch them digitally, though occasionally it is necessary to give an anesthetic to cut and ligate these adhesions.

*Vagina Tightened Too Much.*—In former days this was a common complication, but we now find that we can keep the uterus in quite good position without narrowing the vagina so much as was formerly done.

How far the vagina should be narrowed differs in each case, and the correct amount can only be judged after much experience, but even with the greatest care this complication will occasionally occur.

In this series were two patients who complained that the vagina was too narrow, but the difficulty was easily rectified by digital dilatation under an anesthetic, and without any incision into the tissues.

*Ulcerated Cervix.*—This is a common accompaniment of a complete procidentia, and is due partly to friction of the thighs or clothing, partly to obstruction of the venous return, and partly to infection. If a patient is operated upon while this ulceration is present, there is a very great risk that the site of the operation will be infected, and the wound break down, and I have seen death from general infection follow in one case, while in another the patient was in hospital for a year with pyemia.

I now make it a rule never to operate upon a patient while there is any ulceration, especially as these ulcers will so readily heal. The patient should be kept in bed, the cervix replaced whenever it comes down, and the vagina douched each day, once with boracic lotion and once with alum. If this treatment is carried

out, even the largest ulcer will heal in less than three weeks, and the operation of colporrhaphy can then be performed without any risk of infection.

#### SUMMARY

1. A combination of anterior and posterior colporrhaphy with amputation of the cervix is the best method of treatment for all cases of prolapsus uteri.

2. This operation is the best for all patients with this condition whether young or old, parous or nulliparous.

3. In this series of 549 cases, 529 (95.35 per cent) were cured.

4. This operation is not a cause of trouble in subsequent labors.

5. The prolapse may recur after subsequent labors but in less than 25 per cent of cases.

6. It is necessary to combine an abdominal operation with the colporrhaphy only in those very rare cases where practically no muscular tissue is found in the pelvic floor. In this series it was used only upon two.

#### REFERENCES

- (1) *Cohn, Ernst*: Ztschr. f. Geburtsh. 45: 500, 1888. (2) *Fothergill, W. E.*: J. Obst. & Gynec. Brit. Emp. 16: 29, 1915. (3) *Fothergill, W. E.*: J. Obst. & Gynec. Brit. Emp. 17: 146, 1916. (4) *Idem*: J. Obst. & Gynec. Brit. Emp. 38: 251, 1921. (5) *Donald, A.*: J. Obst. & Gynec. Brit. Emp. 28: 256, 1921. (6) *Fothergill, W. E.*: Proc. Roy. Soc. Med. (Section Obst. & Gynec. p. 43), 1908. (7) *Fraenkel, L.*: AM. J. OBST. & GYNEC. 13: 757, 1927. (8) *Lacey, F. H.*: J. Obst. & Gynec. Brit. Emp. 28: 260, 1921. (9) Trans. Roy. Soc. Med. 23: 35, 1930.

20 ST. JOHN STREET

#### PREVENTION OF CANCER OF THE CERVIX UTERI\*

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AS GYNECOLOGISTS, we are confronted with a most serious problem. The rapid advance in the percentage of cures in cancer of the cervix has slowed down almost to a standstill. The splendid work of the last few decades enables us to save about one-fifth of the patients, but further marked advance seems blocked.

Since the beginning of the study of pelvic diseases, the recognition and treatment of cancer of the uterus has occupied a major place. The diagnosis slowly advanced from the recognition of late conditions by clinical symptoms to the recognition of earlier stages by microscopic examination of suspicious tissue. The treatment has advanced from absolute ineffectiveness to the saving of 20 to 25 per cent of the patients, when the best methods are employed.

\*Read at the Fifty-Eighth Annual Meeting of the American Gynecological Society, Washington, D. C., May 8, 1933.

This great improvement in the effectiveness of treatment, which represents the saving of thousands of lives annually in this country alone, was not secured quickly nor easily. It came as a hard won victory in one of the great battles in human history. There was no spectacular array of armies and forts and trenches and guns and observation balloons and winged raiders of the air, to call attention to the serious activities in progress. Nevertheless, there was a devoted army of workers with units in every civilized nation, who battled silently day and night, year in and year out, against this most insidious and relentless foe of humanity. The problem of the cure of this form of cancer was attacked from every conceivable angle. All over the world workers and institutions and special organizations labored incessantly to solve it.

The result to date is, as before stated, an advance from the losing of all patients to the saving of 20 to 25 per cent when really effective methods of treatment are employed. But here the rapid progress stops. All the wonderful cancer-research institutions with their splendid laboratories and trained workers, and all clinicians with the latest hospital and therapeutic facilities, seem unable to add materially to this average percentage of cures. Large series of late statistics from various countries, evaluated on a common basis, give practically the same result. Improvements in technic of treatment have given some increase in cures, but the increase is so slight compared to the former rapid advance, that it indicates some serious and baffling obstruction in the path of progress.

The recognition of this fact should not discourage us in the fight against this form of cancer. It should stimulate us to greater efforts, to a more careful analysis of all the factors with which we have to deal, and to a more systematic and determined attack on the apparently insurmountable obstacle which blocks advance. As the old song puts it, "Let courage rise with danger, and strength to strength oppose."

What are the elements of the present situation that may have a bearing on the blocking of progress? In the first place, careful scrutiny of the progress made brings an interesting revelation. While 20 to 25 per cent represents the average proportion of cures of all patients under effective treatment, we find that in a certain class of patients the percentage of cures runs to 80 and 90 per cent, and occasionally even to 100 per cent. The very high percentage of cures in this class of patients shows that our present methods of treatment are sufficient to eradicate the disease in nearly every case of this class.

Looking again at the statistics we find that there is another class of patients in which the percentage of cures remains around 20 per cent and below. The percentage varies somewhat in different large

series, but in a general way that seems about the limit of cures in this class, even with the most careful and vigorous use of all our present resources.

What is the decisive element in the extremely favorable class, in which the cancer can be cured almost with certainty? What is the decisive element in the very unfavorable class, in which four out of five individuals are doomed to death? Is the decisive element a race factor or the condition of the general health or some peculiar individual resistance? It is none of these abstruse conditions, but something easily understood and readily recognized, namely, the duration of the cancerous process. If found in the beginning, it can be cured almost certainly. If not found until late, the cure is problematical with a very large proportion of failures inevitable.

If 95 per cent of cases of beginning cancer can be cured and 20 per cent of advanced cases, why does the average percentage of cures hover around 20 per cent? Why does it not average up to 60 and 70 per cent, as might reasonably be expected with all the strenuous efforts made to get the cases early? The reason is that very few cases of cancer of the cervix are seen in the early stage. This fact is clear from the aggregate statistics from all countries. It is strikingly illustrated in our own statistics at the Barnes Hospital of the Washington University Medical School. In the analysis<sup>1</sup> of our five-year results in cancer of the cervix, from 1921 to 1926, 121 patients with this disease were treated. Of the 121 cases only 3 were in an early stage—all the others showing extensive infiltration of the parametrium, most of them out to the pelvic wall. As it happened, all three of the early cases recovered, giving 100 per cent of cures in this class. But the great preponderance of advanced cases over early ones (118 to 3) brought the average of cures down to 22 per cent.

It is perfectly clear then that getting the cancer of the cervix in an early stage is the decisive factor in raising the percentage of cures. Does that solve the problem? One may think so, feeling that the 90 to 100 per cent efficacy in early cases of present treatment-methods, removes the major difficulty in preventing deaths from cancer of the cervix. But I am sorry to say that it does not. Early diagnosis of cancer of the cervix sounds easy, but how can one make an early diagnosis when the patient does not come until a late stage? That states the serious difficulty in a nutshell.

This is not a new discovery. It is an old, old story. For generations the profession has struggled with the problem of getting these cancers early. There has been no lack of recognition of the importance of early diagnosis, and no lack of strenuous and widespread and well-directed efforts to that end. The importance of early diagnosis has been emphasized continuously by leaders in clinical work and in

medical education—through textbooks and medical journals and local, state, national, and international medical societies. Special organizations have taken up the task and disseminated most helpful information to the public through newspapers and periodicals and special publications. Special days have been set aside to arouse interest and promulgate information that would educate the public to the importance of seeking examination at the first suspicious disturbance.

All this has resulted in definite benefit. The early recognition and treatment of external cancers has been greatly advanced. The same may be said of the internal cancers that produce early symptoms, many patients seeking advice for the early symptoms who otherwise would have dismissed them as of no serious import. This applies to cancer of the corpus uteri, which usually causes early bleeding. It has also helped to bring cancer-of-the-cervix patients for advice somewhat earlier, the shift being from the very late toward the middle stage. But even this middle stage represents a wide extension of the cancerous process in the parametrium and to the pelvic wall.

Why is it that intelligent persons with cancer of the cervix seek advice in the middle stage of the disease instead of coming in the early stage? Why is it that, in spite of the widespread dissemination of information through both professional and popular channels, the great majority of these patients do not come to any physician until the disease is already extensive?

It is because of a fact, which we have been slow to acknowledge but which is becoming more and more evident with increasing information, namely, that cancer of the cervix does not cause any symptoms in the beginning. As far as this form of cancer is concerned, the so-called "early" symptoms are early only in the symptomatic sense. They are the first symptoms noticed by the patient, but they do not represent the early stage of the pathologic process. The microscopic change that constitutes the beginning of cancer does not cause bleeding nor discharge. At first there is nothing to suggest cancer to the patient nor to the physician. The really early stage of the disease causes no symptoms whatever. By the time the so-called "early symptoms of cancer" appear, the cancer has already been present a considerable period and has developed extensive, though hidden, prolongations.

It is this discouraging but well-established fact that makes the outlook for further marked advance in treatment-results so hopeless, when viewed from the ordinary early-diagnosis-treatment standpoint. The great campaign for early diagnosis and treatment has largely failed because there are no symptoms in the really early stage. Consequently, the profession is confronted with an apparently insurmountable obstacle to further advance in this direction.



This situation is somewhat analogous to that trying situation which developed in the early days of the operative treatment of cervix cancer. It contains the same elements of enthusiastic attack on a serious problem, of high endeavor to save patients from a fatal disease, of seeming success, and then of subsequent gradual disheartening realization of failure. The parallelism goes even further, for in that situation as in this the cause of the failure was an overlooked pathologic condition, and when that pathologic condition was recognized, the obstacle it placed to further advance seemed insurmountable with the facilities then available. I quote from a recent article<sup>2</sup> containing a brief summary of that former situation.

"Some forty years ago the treatment of cancer of the cervix was just emerging from the stage of mistaken hope in the effectiveness of ordinary hysterectomy. A few years previously the brilliant success of surgery in other gynecologic conditions had raised high hopes for the cure of this dread disease by the removal of the affected organ. Vaginal or abdominal hysterectomy was the accepted treatment. Large series of patients had been subjected to this supposed radical treatment, with excellent immediate results. But the lapse of time had brought revelations that were disconcerting. The large number of hysterectomized patients, who had done so well at first, gradually disappeared by death from recurrence of the cancer. Year by year the mounting number of deaths in the early series raised ominous forebodings. Slowly but surely, in spite of reluctance to accept it and stubborn fighting against it, there came finally the realization that hysterectomy as then carried out was not a cure for cancer of the cervix. In one large series of operations not a single patient survived five years. In other series there was only an occasional survival. The high hopes built on early results had been completely overthrown, and the profession was back where it started, with no cure for this disease.

"However, this harrowing experience was not without beneficial results. It had been demonstrated definitely that there was some unknown factor in the situation or some known factor that required much more serious study. In the attempts to determine the causes of failure of ordinary hysterectomy as a cure for cancer of the cervix, there developed one of the most brilliant and useful pieces of pathologic work in the history of medicine.

"The clear demonstration of minute nonpalpable cancer-prolongations beyond the palpable involvement of the cervix and parametrium, showed why ordinary hysterectomy did not cure the cancer. Whether the prolongations were by continuity of cell-growth or by metastatic transportation of cancer cells to outlying glands, the result was the same, namely, recurrence.

"The problem then became clear. Some means must be found to destroy these outlying cancer cells, which were evidently present in practically every case when the patient came under observation."

Such destruction of outlying cancer cells was impossible with the methods then in use. Did gynecologists drop this seemingly impossible task? Not at all, but on the contrary they attacked the problem with such energy and quiet determination and inexhaustible patience, that the treatment of cancer of the cervix advanced from complete failure to the saving of 20 to 25 per cent of the patients treated.

The advance has now slowed almost to a standstill, because of another obstacle, namely, the absence of symptoms in the really early stage, and the consequent impossibility of the subjective recognition of beginning cancer. Though the splendid campaign of education previously referred to has resulted in bringing these patients somewhat earlier than before, it has not resulted in bringing them in the beginning, because there are no symptoms in the beginning.

The growing appreciation of the importance of the fact that we are not getting these cancers early in spite of all efforts to do so, has resulted in a careful and anxious reexamination of the whole situation as it relates to cancer of the cervix. There is much discussion of what constitutes the earliest cancer changes, and how they may be recognized in the microscopic examination of excised tissue. New methods of clinical recognition, such as ocular magnification in the vagina and chemical reaction, are being tested for discerning beginning cancer changes in the epithelium of the cervix. All these steps for detecting the earliest cancer changes are important and are to be encouraged. But far more radical measures than these are necessary to produce any marked advance in the prevention of deaths from this disease. It is necessary to attack this serious problem in some other way than by explaining cancer signs and symptoms to physicians and patients. We must go back of the whole cancer picture, and remove the conditions which precede the cancer and cause it.

It is well established that cancer of the cervix comes from long-continued irritation in the form of chronic cervicitis, usually accompanied with laceration, eversion, infiltration, and cystic change. As I have said many times, these lesions are very obvious and their rôle in cancer origin is generally known, and yet they are allowed to go on and on well into the cancer age. Great pains are taken in cases of chronic cervicitis to detect the first signs of cancer so that treatment for cancer may be promptly instituted, whereas a far safer plan is to remove the chronic cervicitis promptly before it becomes cancer.

Chronic cervicitis may be cured by simple excision of the affected area of the cervix, and thus cancer prevented. But when cancer has once begun in the irritated area, cure is uncertain even by the most radical measures.

It is clear then that an important step in preventing deaths from cancer of the cervix is the systematic and early removal of those chronic irritative lesions of the cervix which precede cancer. Not only is this an important step, but it seems the only step by which to secure further marked reduction in deaths from this disease.

The importance of removing chronic irritative lesions in the cervix has long been recognized and emphasized by leaders in gynecology. My hope is to supplement these sporadic warnings with a systematized

plan of action which will deal effectively with this serious situation. All that I have said before is only preliminary to this main theme—an introduction to make clear the serious situation and show the compelling importance of putting into practice some really effective procedure.

In formulating such a plan the following three facts must be taken into consideration:

1. Thousands of patients are receiving palliative treatment for chronic irritative lesions in the cervix, such as cervicitis, "ulceration" of cervix, laceration, eversion, erosion, and polypi. The palliative measures keep the patients fairly comfortable, but they do not remove the deep chronic irritation which favors the development of cancer.

2. Other thousands of women are treating themselves for a "little leucorrhea" in ways that may keep them comfortable but do not stop the process of cancer development in the irritated cervix.

3. There are other women in which the chronic irritation in the cervix does not give rise to any symptoms that would cause the woman to suspect local trouble.

In the attempt to eliminate these chronic irritative lesions, which eventuate in a large number of deaths from cancer of the cervix, means must be found for reaching the above-mentioned three classes of persons. Effective work in this direction requires energetic action along two important lines as follows:

1. Work by individual physicians with their patients, to the end that chronic irritation in the cervix be removed before it eventuates in cancer.

2. Extension of present excellent educational work to include measures for making clear to the public the fact that cancer of the cervix develops without any warning signal, hence the importance of local examination, that any existing irritation of the cervix may be eliminated before cancer develops.

The above twofold plan takes care of the problem theoretically, but we cannot be satisfied with theory and principles only. This is such a serious matter that details must be carefully worked out and tested and every possible means devised and activity employed to secure results. The issue of life or death is being decided daily for many persons. While we are considering the subject, some of our own patients—even members of our own family—may be crossing the line between inflammation and cancer. The working out of the principles of a plan is only a part, and the smaller part, of the solution of this great problem. A systematic and comprehensive plan of campaign is quite necessary in a war, but no plan can win a war. The war is won by the application of the plan to the securing of results—the success-

ful meeting of the opposition, the prompt adaptation to unforeseen developments, and the actual attainment of the important objectives. These hard facts apply likewise in this war on disease.

Each of the two large divisions in the twofold plan mentioned has subdivisions which require careful and extended consideration in order to secure practical action and the attainment of definite results. At this time principal consideration will be given to the work of the individual physician with his patients.

#### WORK OF PHYSICIAN WITH HIS PATIENTS

The physician is the leader and mainstay in this serious campaign. Each physician has it in his power to aid materially in the general reduction of deaths from cancer of the cervix and in saving his individual patients from this fatal disease. This is a wonderful opportunity for important constructive work by every physician. Cancer is such an extensive subject, with such deep and abstruse problems baffling the talent and facilities of great institutions, that we are inclined to think that important work in connection with it must be entirely the privilege of those with special training and special facilities. But here is an opportunity for every physician to give definite aid in the great fight which is going on all over the world to lessen the number of deaths from cancer of the uterus. No matter where the physician is located nor how limited his facilities, he has it in his power to take an important part in this great work.

The details of effective work by the physician in this direction include the following:

1. In the handling of patients with inflammation or irritation of the cervix, chronic irritation must not be allowed to persist. This applies especially to patients past thirty-five, though cancer occurs also before that age. Having eliminated acute irritation by douches and local treatment, any remaining chronic irritation should be removed by excision or other radical measure. I do not care at this time to take up the pros and cons regarding the different methods of treating these minor lesions of the cervix; suffice it to say that the treatment should eliminate the chronic irritative lesion. Temporizing palliative treatments do not remove the danger.

It is important to remember that a certain proportion of cancers of the cervix (in some series as high as 10 per cent) occur before the age of thirty-five. This means that the old idea of postponing repair of the cervix to the end of the childbearing period is not safe. We know that chronic irritation in the cervix may result in cancer in younger women. Several cases of patients under the age of thirty have been reported. Consequently it is dangerous to allow irritation in the cervix to persist even in the childbearing period.

The only safe plan is to eliminate the area of chronic irritation. Carried out circumspectly with care to avoid undue sacrifice of normal tissue and unnecessary scar formation, it should aid rather than interfere with subsequent childbearing. Even though there should be some laceration with a subsequent labor, repair of this is a minor matter compared to risking cancer development.

2. Patients in whom cervical irritation has cleared under treatment, should be watched by occasional check-up examination to see if the irritation returns.

3. Patients who come for other conditions, should be asked about leucorrhea and other evidence of pelvic disturbance, that the required examination and treatment may be carried out.

4. Patients who come for other conditions and have no pelvic symptoms, present one of the difficult problems in this cancer prevention. We know that even without subjective symptoms there may be sufficient chronic irritation in the cervix to favor aberrant cell-activity resulting in cancer. On the other hand, a practicable rule of action must take into consideration the patient's natural reluctance to examination not indicated by symptoms.

Here is where the leadership of the physician comes in. By tactful instruction, that causes no undue apprehension, the patient may be made to realize the advisability of a local examination as part of the general examination on which his responsible advice to her is to be based. The age at which such local examination is required in patients without pelvic symptoms will vary somewhat with the history and circumstances, but in general it is advisable by age thirty-five or earlier.

From the physician's standpoint, this local investigation as part of the general examination is imperative. His responsibility as the patient's medical adviser makes it necessary for him to know definitely whether or not there is beginning cancer of the cervix or chronic irritation there that may lead to cancer. The internist, the general practitioner—every physician who assumes the responsibility of advising a patient in regard to her general health—must keep in mind the possibility of symptomless chronic irritation in the cervix that may eventuate in cancer.

5. How often should the local examination be repeated? The patient will sometimes ask this question. And the physician should have decided it for himself in preparation for advising the patient, whether or not she asks it.

It is important to work out a practicable plan. The local examination should be made often enough to reasonably exclude irritation that would favor cancer development. At the same time the interval should be as long as is safe, in order to avoid unnecessary trouble and expense to the patient. Also, the choice of interval should be such as to appear reasonable to most patients when the matter is explained to them. The choice of a rather long interval which appears to the patient so reasonable that she returns regularly, will go much farther toward preventing cancer than the choice of an interval so short that the patient neglects it and finally gives up regular examinations. Considering the various angles of the matter, it seems to me that a reexamination once a year from age thirty-five to fifty-five, is a reasonable rule to incorporate in our advice to these patients.

The probability of the patient's cooperation in the idea of a regular yearly examination may be enhanced by pointing out that this twenty-year period is one of change in body structure and function, and that many authorities are recommending yearly general examination as a safety measure to determine how the various vital organs are standing the wear and tear of life's activities. This reenforces and emphasizes the idea of regular general examinations, of which the local examination is a part.

In the years before thirty-five and after fifty-five, occasional examinations are desirable, but for the present it seems best to concentrate on the twenty years mentioned, and to use our energy and educational facilities to drive home the importance of regular yearly examination during that crucial period.

It is necessary to give the public reliable information on this subject for two reasons: first, to supply to those persons who do not consult a physician the information they would not otherwise obtain and, second, to emphasize to patients the importance of following the advice on this subject given by their physicians.

An important part of the instruction of the public in this matter will come indirectly from the individual physician, through the general contacts and conversation of his patients to whom he has given advice.

The other important means of public instruction include the local and state and national medical societies and those special organizations of mixed professional and lay membership which have been so helpful in disseminating reliable information on health matters. The American Society for the Control of Cancer has done splendid work in educating the public to an appreciation of cancer symptoms and the importance of seeking prompt relief. To it naturally falls the leadership in this additional step for preventing deaths from cancer, namely, instruction of the public as to the necessity of regular periodic examinations for the discovery and removal of chronic irritative lesions that precede cancer. Considerable work has already been done along this line, but much more remains to be done in regard to cancer of the cervix.

My allotted time has been devoted to the first half of the twofold plan, namely, the work of the physician with his patients. The second half, i.e., effective instruction of the public in the prevention of this form of cancer, can only be mentioned here. But it is of great importance and calls for the same careful detailed study and planning, and vigorous execution urged under the work of the individual physician.

#### REFERENCES

- (1) *Crossen, H. S.*: AM. J. OBST. & GYN. 22: 559, 1931. (2) *Crossen, H. S.*: J. A. M. A. 99: 2149, 1932.

UNIVERSITY CLUB BUILDING.

## THE OCCIPITOPOSTERIOR POSITION\*

A METHOD OF MANAGEMENT, WITH AN ANALYSIS OF 976 CASES

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THE continued high fetal mortality, maternal injury, and morbidity in the delivery of the occipitoposterior position is, I believe, sufficient justification for this communication.

Many indeed, have been the methods advocated for the management, more particularly of the so-called impacted cases; but their effect in the reduction of fetal mortality, maternal injury, and morbidity have been disappointing.

The frequency of any obstetric abnormality will always vary in different countries and even in different parts of the same country.

The posterior occiput is no exception; various authorities show an incidence as high as 29.8 per cent, and our own incidence is 13.8 per cent of vertex cases.

Discussion of the frequency is of little value, as it is conceded by all to be the most common obstetric anomaly and is responsible for a high fetal wastage and greater maternal injury than almost any other condition.

In the analysis of 976 cases of occipitoposterior position during a period of six years, observed at the Royal Victoria Hospital, primiparas and multiparas show an almost equal ratio (513 to 463).

The right occipitoposterior was almost twice as frequent as the left (619 to 357), but by no means in the proportion that is usually quoted (Williams 5 to 1).

The large number of normal pelvis (864) and conversely the small number of pelvic contractions (112, or 11.6 per cent) as determined by the usual methods of pelvimetry, were quite unexpected. While of the pelvic contractions the flat pelvis was almost twice as frequent as the funnel, the actual number is too limited to draw any definite conclusions.

Besides, although all types of pelvic contractions are usually quoted as an etiologic factor in the production of posterior positions, external pelvimetry alone, or combined with internal estimation, frequently does not, and cannot reveal the true type. Even the x-ray examination of the parturient pelvis has not altogether proved of the help that was hoped from it.

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Although the work of Thoms on x-ray pelvimetry, and more recently that of Caldwell and Malloy on male stigmas, point out certain important facts which may possibly explain the frequency of posterior positions of the occiput and even their cause, nevertheless, both of these authorities show a somewhat different type of pelvis: the former, the transversely contracted (quoting 20 cases), and the latter, the funnel or masculine type. Thoms states that a high assimilation is of frequent occurrence, and associated with it there is a shortening of the transverse diameter. With this view, many authorities are in accord.

Fabre and Trillat (in 1920) from x-rays of 12 pelves, all of which showed sacralization of the fifth lumbar vertebra, coined the term, pelvis with anteroposterior diameter predominating, or, in other words, a high assimilation. Seven of these were delivered as occipitoposteriors.

They state that "this has the relation of cause and effect, and this special form of superior strait is the principal cause of occipitoposterior." Thoms says that "not only are such pelves associated with occipitoposterior, but lesser degrees of transverse contraction, whether due to assimilation, male type of pelvis, or unnamed causes, are definitely associated with primary and persistent occipitoposterior." He concludes that the shape and type of pelvis is the most potent cause of primary occipitoposterior position. Caldwell states that "male stigmas in the female pelvis tend to limit pelvic capacity. This is manifested in the type of sacrosciatic notch." There is a definite relation between type of notch and internal diameter of the true pelvis.

"Variations in the size and shape of the notch are associated with a change in sacral inclination and so diminution of pelvic capacity. Given a normal notch, all internal diameters are decreased." This limitation of pelvic capacity is prone to occur in the portion of the pelvis posterior to the ischial spines.

"With the male type of notch, the sacrum moves forward in the pelvis, decreasing the length of the sacrospinous and sacrotuberous ligaments. [That is, the distance between the sacrum and tuberosities and ischial spines.] This decrease means taut, unresistant tissues, increasing the difficulties in labor, rotation may fail to occur or posterior positions more frequent with fixation of the head, or arrest in this unfavorable position."

While accepting the work of both of these authorities as of great importance, and admitting that on certain clinical grounds the weight of evidence is in favor of both views, as both types of pelves are frequently associated with posterior positions, how may one explain the fact that in many occipitoposterior positions in which the head has not entered the pelvis, or cannot enter with the occiput behind, a change to the anterior position allows of easy descent? It is not a question of disproportion necessarily, for that is most frequently only apparent. Convert the posterior occiput to an anterior one and its entrance into the pelvis readily occurs. If the pelvis was the only factor in the causation, alteration of the position of the occiput should not make such a decided, in fact often spectacular, difference to its descent. Again, it is not entirely the loss of flexion which prevents



descent, for in many instances, flexion is well preserved. May the true etiologic factor not lie in the uterus itself? With the placenta on the anterior wall, the child's back would more readily accommodate itself to the unoccupied posterior portion of the uterine cavity. This has frequently been proved by cesarean section. Again, with the development of the uterus from two müllerian tracts, one-half may develop to a greater extent than the other, thus allowing of accommodation of the fetus readily to the more developed side. A summary of maternal injury, morbidity, and fetal mortality throughout the whole series of 976 deliveries shows that as regards maternal results, the cervix suffered injury in 33 cases, 3.3 per cent, necessitating repair. It is necessary to state in regard to maternal injuries, that it is a rule of the clinic that after any operative procedure, the cervix must be exposed and any tear of half an inch or more sutured, an essential reason for the apparently high percentage of injuries. There were 71 complete tears. Among these cases of complete tears were included those in which the sphincter was torn partially, or completely through, whether involving the anal mucosa or not. This interpretation has been taken throughout the entire series, because experience has shown that occasionally even though the anus escaped injury, or the sphincter was only partially lacerated, the devitalization of tissue subjacent to the sphincter may have been such that necrosis occurs, with a subsequent sinus into the anus and infection in the perineum. True, these usually heal eventually without the necessity of a secondary repair, but from a practical point of view, they may as well have involved the anus. Maternal morbidity occurred in 249 cases or 24.4 per cent.

The standard of morbidity used was a single rise of temperature to 100.6° F., occurring during the puerperium after the first twenty-four hours. Fetal deaths were 44, or 4.5 per cent, and included stillborn and those that died during the first two weeks of life.

Monstrosities and macerated, as well as nonviable babies up to six and a half months have been excluded because their loss is in no way due to the position.

An analytical study of these cases of occipitoposterior position shows that failure of rotation is a primary factor in the causation of fetal mortality and maternal morbidity. Throughout the entire series of both spontaneous and operative delivery this fact is evident.

What then are the chief causes of failure of rotation and should such occur, what method can we adopt as conducive to the best results?

The common causes of failure of rotation are imperfect flexion, an inadequate uterine force, a poorly developed or relaxed pelvic floor, and the inability of the fetal trunk—the back and so the shoulders—to move forward toward the symphysis, for so long as the shoulders are prevented from rotating, so long must the rotation of the occiput fail.

This is a frequent cause of failure of rotation in attempts at either manual or forceps rotation of the occiput in the pelvis, inasmuch as, on the removal of the hand or forceps, the occiput immediately swings back to its original position.

The cause of failure of rotation of the shoulders is commonly found to be an internal contraction ring, situated around the child's neck, or just in front of the shoulders, and is the lower border of the active uterus. Our opinion regarding the situation and frequency of these rings is in conformity with the experience of Sidney Smith in the Brooklyn Hospital series.

It is evident that any method aiming at operative delivery which fails to take cognizance of this fact must necessarily meet with many difficulties, or even failures.

I therefore add my plea to those of the writers who have advocated early interference in occipitoposterior positions, because, at least two very frequent causes of failure of the head to advance, namely, imperfect flexion and the development of an internal contraction ring, will be eliminated or rendered less likely.

On the basis of the analysis of these cases as regards maternal and fetal results, I shall endeavor to describe the method which above all others, except spontaneous anterior rotation and birth, has proved in my hands and those of the members of the Staff to be productive of the best results.

#### PROCEDURE

It is our custom not to interfere during the first stage of labor, except by those therapeutic methods which aim at the relief of pain. After complete dilatation of the cervix, labor is allowed to progress naturally as long as the head is advancing rapidly. Failure of the head to advance demands immediate determination of the cause and its correction. It is usual in such cases to find the membranes ruptured, the sagittal suture of the child's head lying in one or other oblique with occiput behind, or in the transverse diameter of the pelvis. Flexion of the head is, as a rule, imperfect, the head being engaged in the pelvis. There may, or may not, be undue moulding, depending on the duration of the second stage. With the whole hand in the vagina, the perineum and pelvic floor are thoroughly dilated. The entire head is carefully palpated, if necessary, to make a correct diagnosis as to the position, the degree of moulding, and the type of head. The head is dislodged completely and pushed up above the pelvic brim. The hand is passed through the cervix beyond the occiput (Fig. 1). If any resistance is encountered, such as a contraction ring around the neck, it is carefully "ironed out." The anterior shoulder is palpated and its position determined. If the shoulder appears to be directed forward, it is ignored; if the child's back is found to be directed toward the maternal back, the shoulder is carried forward as far toward the antero-posterior diameter as possible. The head is now placed so that it lies with the sagittal suture in the transverse diameter of the brim, the posterior ear resting in the palm of the hand. The back of the hand will then be lying on the promontory of the sacrum. The posterior blade of the forceps is now applied along the palm and placed exactly over the posterior ear, with the pelvic curve toward the occiput (Fig. 2). The handle of the forceps is held by an assistant to prevent slipping

during the application of the second blade. The hand is then withdrawn, and the anterior blade is carefully passed across the face of the child until it lies over the anterior ear, i.e., directly opposite the first blade (Fig. 3). There can be no possible danger of injury to the bladder during this or any subsequent part of the procedure, because all manipulations are done above the brim of the pelvis where



Fig. 1.



Fig. 2.

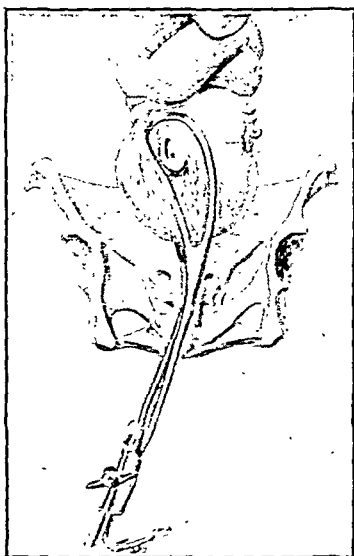


Fig. 3.

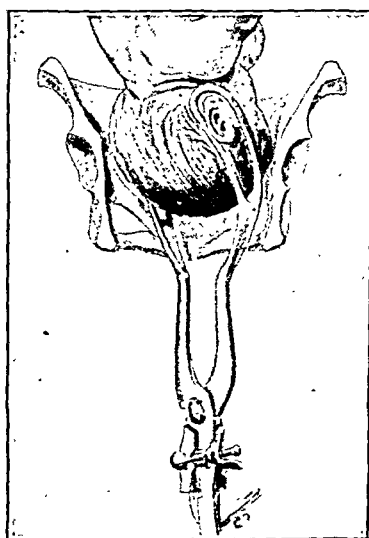


Fig. 4.

there is plenty of room. The forceps is now locked. A gentle movement of  $45^\circ$  rotation is now imparted to the forceps, the object of this movement being to bring the occiput to an obliquely anterior position (Fig. 4). Every step in the maneuver up to the present time is done with the head free from pelvic control. The head is now lying within the forceps at the brim of the pelvis, the sagittal suture is in relationship with one of the oblique diameters, and the occiput is obliquely anterior (Fig. 5).

With traction, the head is once more brought down into the pelvis (Fig. 6). It is astonishing the ease with which the head descends on to the pelvic floor and delivery is accomplished.

Usually in this method, the head is brought down in the opposite oblique diameter to that which it originally occupied, i.e., the R. O. P. will be brought down after rotation as an R. O. A., the L. O. P. as an L. O. A. (the left hand being used in right position and vice versa).

Criticism of the method on the basis that completely dislodging the head from pelvic control increases the danger of prolapse of the cord, or hand, or, that a high forceps, or a forceps operation on the floating head is done, is exaggerated. Although admitted on theoretical grounds that the cord may prolapse, this complication did not occur in a single instance, for with the hand already controlling the head in the lower uterine segment, the cord could readily be kept from prolapsing dur-

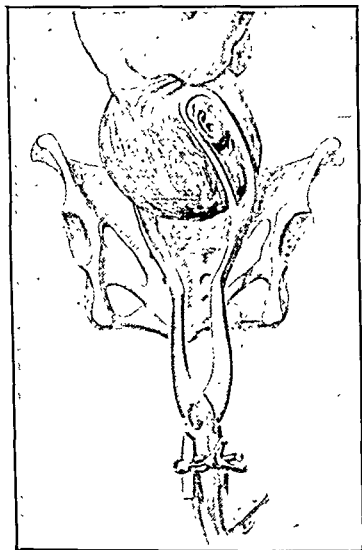


Fig. 5.

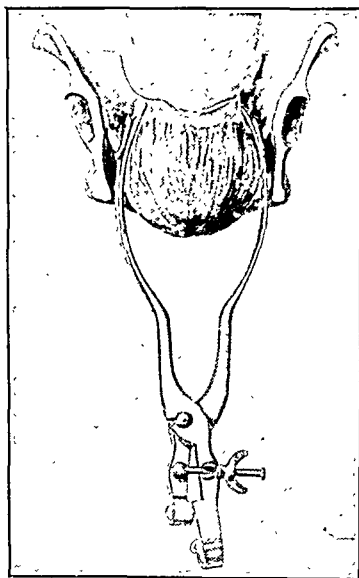


Fig. 6.

ing the application of the blades. Even in the event of such an accident, it would not necessarily endanger fetal life to any great extent, subsequent delivery being accomplished in all cases with facility.

Again, before its displacement the head was engaged and had undergone moulding in the pelvis. To dislodge it entirely and bring it down once more into the pelvis in a corrected position is in no manner similar to the high application of forceps to a head that had never entered the pelvis.

The maneuver in our hands has proved absolutely safe and eminently successful. A reference to the fetal mortality throughout the entire series of cases is the best evidence of its value.

No other method of delivery has given us comparable results. The two fetal deaths occurring during this method of delivery represent the gross mortality. Both could have been avoided. One was a pri-

vate patient of my own, a primipara in whom there was a marked degree of disproportion due to a generally contracted pelvis and a large baby. Cesarean section was advised before the onset of labor and refused. The other death occurred as the result of a prolonged labor of eighty hours, and the baby had a failing heart.

### RESULTS

In the 976 cases of occipitoposterior positions spontaneous birth occurred in 392 or 40.1 per cent. Among these spontaneous deliveries, anterior rotation and birth occurred in 284 or 72.4 per cent; all the pelvis were normal as regards pelvimetry. There were no cervical injuries, but in spontaneous birth, the cervix is not exposed unless bleeding occurs. There were no complete tears. The morbidity was 18.6 per cent. There were no maternal deaths, but a fetal loss of 2 or 0.7 per cent, both of which were due to intracranial injury, hemorrhage, and tentorial tears. The remaining spontaneous births, 108 or 27.6 per cent, remained persistently posterior and were born as "face to pubes." These showed a marked increase in both fetal mortality and maternal morbidity, the latter being 33 or 30.5 per cent. The fetal mortality was 6 or 5.5 per cent.

An analysis of these spontaneous births shows that the maternal morbidity and the fetal mortality rises in proportion to the failure of anterior rotation, even though labor may progress fairly satisfactorily and natural birth occur.

It is a moot question whether the higher fetal death rate in the "face to pubes" is due to prolongation of labor, or to other factors, such as imperfect flexion, or to those causes which prevent anterior rotation, such as excessive moulding and distortion of the head with a large caput, for it is undoubtedly true that whenever anterior rotation fails labor is likely to be prolonged.

In addition, the same factors which prevent forward rotation of the occiput are probably responsible for the occiput turning backward into the hollow of the sacrum.

Undoubtedly, the cause of fetal death resultant upon labor is intracranial injury, as has been proved by Holland, Ehrenfest, and many others, as well as in our own experience. About 80 per cent of all fetal deaths in the clinic go to autopsy.

The total operative cases were 584 or 59.8 per cent of the whole series, primiparas 65 per cent, multiparas 37 per cent. The right position was more frequent than the left in about the same proportion as the parity.

Pelvic contractions played an apparently large factor, occurring in 102 cases or 17.4 per cent, with the funnel type constituting the minority. Nevertheless, many of the generally contracted variety were also of the funnel type.

The number of maternal injuries, cervical and complete tears, commands attention, being 33 or 5.6 per cent of the former and 68 or 11.6 per cent of the latter.

In 157 low forceps operations there were no cervical tears, but 12 complete tears, 6 of which occurred in "face to pubes" birth, or expressed in another way, 45 low forceps operations delivering as "face to pubes," resulted in 6 complete tears. The definition of the term "complete tear" given at the beginning of this paper, explains to some extent the high incidence.

There were 37 morbid cases, or 23.5 per cent, 2 maternal deaths neither of which was due to the position or operation. One patient had placenta previa and died on the fourteenth day postpartum of sepsis; the child survived. The other patient with an eclampsia had a bag induction but died the second day postpartum; the child also died. Both of these were "face to pubes" births. There were four fetal deaths or 2.4 per cent.

The maternal morbidity in the operative series is 27.5 per cent, 163 cases in 584 deliveries. The apparently high morbidity is to be explained by the rigidity of the standard used and already defined, and because the great majority of these cases showed only a single rise of temperature to 100.6° F. Under any other standard, such as the British Medical Association, the morbidity would be below 10 per cent.

One might expect a higher morbidity rate in operative procedures than in spontaneous birth. In fact, the "higher up" in the generative tract one goes, the more likelihood of infection, is the usual dictum. Yet, this is not necessarily true, because of numerous other factors.

The low forceps operation was responsible for almost as high a morbidity (23.5 per cent) as any of the forceps methods. True, it is much greater than the spontaneous anterior rotation and birth, which was 18.6 per cent. Nevertheless, spontaneous "face to pubes" birth showed a morbidity of 30.5 per cent. The most likely reason for this is the natural tissue devitalization associated with an anomalous position, and the prolongation of labor which is usually present in the "face to pubes."

Operative procedures, therefore, within certain limitations should tend to diminish the morbidity risk rather than increase it.

In the classical midforceps operation there were 209 cases of which 168 had normal pelves and 41 contracted pelves, represented by an almost equal number of the three main types (flat, generally contracted, and funnel).

The cervix was injured 11 times, of which 7 occurred when the head was delivered in an anterior position and 4 in "face to pubes" delivery.

There were 39 complete tears or 18.6 per cent, of which 17 or 21.1 per cent occurred in "face to pubes" birth.

Maternal morbidity was 58 or 27.2 per cent, of which 22 or 30.9 per cent occurred in "face to pubes" birth and 36 or 26.0 per cent in anterior rotation and midforceps delivery.

There was 1 maternal death (0.4 per cent), a patient with acute exudative fibrinous endocarditis, who died on the fifth day; the child also died. Fetal deaths, 16, or 7.6 per cent.

The Scanzoni operation was done 67 times, contracted pelves being present in 15 of these cases.

There were 6 cervical tears or 8.9 per cent and 10 complete tears, 14.9 per cent.

Thus it is evident that in forceps procedure—the Scanzoni operation and the method already described—the morbidity was almost the same, being 25.3 per cent and 26.1 per cent respectively.

The classical midforceps operation after anterior rotation had occurred, showed a morbidity rate of 26.0 per cent; in fact, the three chief forceps operations gave equivalent morbidity percentages, while, if anterior rotation failed and delivery occurred as "face to pubes," the rate was 30.9 per cent. It is therefore obvious from this analysis that "face to pubes" birth, whether spontaneous or operative, increases the morbidity hazard remarkably.

The high forceps operation was responsible for a morbidity of 55.5 per cent and a fetal death rate of 11.1 per cent.

#### FETAL DEATHS

A comparison of the various operative methods in relation to fetal death reveals some striking results.

In the low forceps operation, there were 4 fetal deaths, i.e., 4 deaths in 157 cases, or a wastage of 2.48 per cent. In spontaneous anterior rotation and midforceps, there were 138 cases with 12 fetal deaths, or 8.6 per cent. Midforceps and "face

to pubes," 71 cases, with 4 fetal deaths, 5.6 per cent. The Scanzoni operation, or its modifications, 67 cases, with 5 fetal deaths, 7.46 per cent. The author's method, 107 cases with 2 fetal deaths, or 1.8 per cent. High forceps, 27 cases with 3 fetal deaths or 11.1 per cent. Version and extraction, 17 cases, with 6 fetal deaths or 35.7 per cent.

It is therefore evident that the gross operative fetal mortality is much higher than that in spontaneous birth as a whole, being 6.1 per cent in the former to 2.04 per cent in the latter, yet if anterior rotation failed and delivery occurred as "face to pubes," the fetal wastage is almost the same, 5.5 per cent (face to pubes).

This failure occurred in 27.5 per cent of the total spontaneous labors. Again, the proportion of spontaneous to operative birth is approximately 3 to 5. Failure of anterior rotation is therefore a primary factor in fetal wastage and accordingly demands prompt correction. The longer correction is delayed, the greater the fetal risk. In fact, there is a correlation between the duration of labor and the fetal death rate. The average duration of labor in the operative series terminating in fetal death, was fifty hours, whereas the average duration in successful results was thirty-one hours. The average duration in spontaneous labor with fetal death was twenty-three hours.

#### CONCLUSIONS

1. The apparently high incidence of maternal injuries is to a certain extent explainable: first, as regards the cervix, all tears whether large or small following operative delivery are repaired immediately, many such being of a very minor degree; second, the term "complete tear" is not confined to those in which the anal canal is involved, but includes all lacerations of the sphincter ani.

2. The morbidity rate is based on high standard: a single rise of temperature of 100.6° F. occurring at any time during the puerperium after the first twenty-four hours, from any cause whatsoever, without any attempt to eliminate those which were not strictly obstetrical.

3. The increased morbidity rate associated with the failure of anterior rotation whether labor was spontaneous or operative, is to be noted. In fact, "face to pubes" birth was responsible for a much higher morbidity than any other delivery, spontaneous "face to pubes" being 30.5 per cent.

4. The close similarity in the morbidity rate among all the forceps operations is instructive.

5. The best fetal results were obtained by the method especially described, being less than that in spontaneous birth as a whole.

6. Early interference in occipitoposterior positions is conducive to the best results.

7. Prolapse of the cord while a theoretical possibility did not occur once in 107 cases in which the head was dislodged from the pelvis.

8. The importance of recognizing that an internal contraction ring is a frequent cause of delay in labor and by no means an occasional occurrence.

9. A correct diagnosis is absolutely essential for success and is best obtained by freeing the head from pelvic control.

## END-RESULTS IN TREATMENT OF PELVIC INFECTION\*

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*(From the Clinic of the Woman's Hospital)*

ALTHOUGH much has been written about the treatment of salpingitis, the fact, that in the management of every obstetric or gynecologic case, we must be concerned with the prevention or treatment of pelvic infection, makes the subject one of constant importance to us.

From laboratory studies and clinical observations, we now have certain fairly well established facts regarding salpingitis which, in the past twenty-five years, have greatly influenced treatment.

These facts are too well known to the members of this society to need any comment. However, I wish to mention those which have an important bearing on this study.

It is quite generally conceded, by the various authorities, that:

1. Seventy to 75 per cent of all cases of salpingitis are gonorrheal in origin, but by the time the patients come under observation, the cause, in a high percentage, cannot be demonstrated.

2. Gonorrheal salpingitis is a self-limited disease which, by the process of auto-sterilization, tends to heal spontaneously. In about 85 per cent of cases, healing would be complete provided reinfection could be prevented.

3. Infections, other than specific ones, are caused by organisms which may continue to live in the tissues for indefinite periods of time, regardless of symptoms.

4. Infections caused by non-specific organisms also tend to heal spontaneously. Nature's success, in healing such inflammations, depends upon the type of infection and period of time allowed for healing to take place.

5. Death from general peritonitis caused by extension of infection from the tubes or rupture of a tube is extremely rare.

All of these known facts, regarding pelvic infection and the clinical courses of the various types, indicate that any attack of such inflammation should first be treated by palliative means.

Furthermore, these facts and end-results, especially of operation, have compelled gynecologists and most general surgeons to adopt conservative methods of treatment. The result has been a great increase in the number of spontaneous cures, proving that many operations previously done were unnecessary.

As the Woman's Hospital policy has become more conservative, the number of patients treated and discharged without operation has gradually increased. The first part of this study was undertaken to determine how successful palliative treatment, in these cases, had been.

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\*Read, by invitation, at the Fifty-Eighth Annual Meeting of the American Gynecological Society, Washington, D. C., May 8 to 10, 1933.



A study was therefore made of end-results in 1021 admissions of 831 patients over a period of approximately ten years. Of these patients 671 were admitted once, 136 twice, 51 three times, and 28 four times.

The study of end-results, in patients treated by palliative means, was greatly facilitated by the fact that a fairly high percentage returned for examination in our follow-up clinics after being discharged from the hospital. The records showed that 81 per cent had returned for examination, an additional 8 per cent had been followed by the social service department and 11 per cent could not be traced after being discharged.

Patients were not admitted to the wards for treatment unless they were too ill to be ambulatory, or to have care at home. Ambulatory cases were treated in the out-patient department with intradermal protein injections, vaginal douches, medicated tampons and, when necessary, cauterization of the cervix. A considerable percentage of those admitted to the wards had had palliative treatment in the out-patient department, but failed to get adequate relief.

In our experience protein therapy has proved especially efficacious and often, in spite of rather extensive pelvic pathology, has kept patients sufficiently symptom-free to enable them while healing was going on, to continue with their routine duties. In such cases lack of rest undoubtedly retards, but does not necessarily prevent, healing.

As the milder cases were treated in the out-patient department, those admitted to the wards constitute a group with the more severe symptoms and more extensive pathology. It is therefore apparent that a résumé of results of palliative treatment in hospital cases does not give a true picture of the success which might be expected if all patients who apply for treatment were included.

Table I shows the age incidence of patients at the time of admission, and indicates that the greatest incidence of infection occurred in the latter half of the third decade of life.

TABLE I. AGE INCIDENCE

AGE	NUMBER OF ADMISSIONS
Up to 20	70
20 to 25	231
25 to 30	270
30 to 35	207
35 to 40	144
40 to 45	73
Over 45	26
Total	1021

Of the 831 patients admitted 422 were white and 409 colored. Of the 1021 attacks of infection treated 111 occurred in single women, and 910 in women who were, or had been, married.

Of the 831 patients admitted 301 were nongravid; 298 had had full-term deliveries; 246 had had spontaneous abortions and 95 had had induced abortions.

#### ETIOLOGY

The fact that more than one-half of the admissions were for recurrent attacks of infection, and that the attacks had in many instances been treated for long periods of time before admission, made it impossible definitely to establish the cause of the infection in a high percentage of the attacks. Table II shows that in 774 (72.8 per cent) of the 1021 admissions the cause of the inflammation could not be determined.

TABLE II. ETIOLOGY

TYPE OF INFECTION	NUMBER OF ADMISSIONS
Gonorrhea	56
Postabortal	118
Postpartum	70
Tuberculosis	3
Undetermined	774
Total	1021

#### DIAGNOSIS

The difficulty in establishing a high percentage of accurate diagnoses in such a series of cases is recognized. Throughout the course of treatment and observation of each patient, in the hospital and follow-up clinics, numerous bimanual examinations are invariably made by at least two surgeons. After a survey of these physical findings, the hospital temperature record, repeated white and differential blood counts, and in many cases blood sedimentation time estimations, it is felt that most of the errors in diagnosis can be eliminated. For instance, definite adnexal masses which, while under observation, are gradually absorbed and disappear, as signs of inflammation subside, can hardly be mistaken for other conditions. Likewise, a tender pelvic mass thought to be a tuboovarian abscess at admission may subsequently prove to be a cystic ovary or fibroid associated with mild inflammation.

Therefore, the established diagnosis in each case in the series is not based entirely upon findings at time of admission, but rather upon findings throughout the entire course of the disease.

TABLE III. DIAGNOSIS

TYPE OF INFLAMMATION	NUMBER OF ADMISSIONS
Acute Salpingitis	452
Subacute Salpingitis	105
Pyosalpinx	17
Tuboovarian Abscess	28
Chronic Salpingitis	419
Total	1021

Table III is a summary of the 1021 admissions classified according to the types of infection which existed at the time hospital treatment began.

#### PHYSICAL FINDINGS ON ADMISSION

Patients, admitted to the hospital, were treated for various degrees of inflammation, determined by physical findings, as follows:

1. Masses: Cases with definite adnexal masses.
2. Induration: Cases without palpable adnexal masses, but with induration or thickening, the result of tissue infiltration and plastic exudate, in one or both adnexal regions.
3. Tenderness: Cases of early or mild inflammation which, on examination, except for extreme tenderness of the pelvic organs, were free from physical findings.
4. Fixation: Cases in which the uterine appendages were fixed but were free from evidence of tissue infiltration of the adnexal or periadnexal structures.

In the series being reported 332 cases were treated for adnexal masses, 189 for thickening or induration, 96 for tenderness and 214 for fixation of the adnexal structures.

In addition to these findings diagnoses were based on the other usual signs of inflammation such as leucocytosis, fever, and rapid sedimentation time.

Of the 1021 admissions 641 were for salpingitis alone, 173 for salpingitis and retroversion, and 181 for salpingitis and myomas. These cases, which had other pathology as well as pelvic infection, were included in the series because they were treated primarily as cases of salpingitis, and were discharged without operation as soon as the inflammation subsided.

#### PALLIATIVE TREATMENT

Palliative hospital treatment consisted of rest in bed until the patients were afebrile, and subjective symptoms had practically disappeared. Patients were also kept in bed until the inflammatory exudate, as indicated by physical findings, had for the most part been absorbed. Of the 1021 inflammatory attacks, 504 (49.5 per cent) were treated with protein injections. Sterilized cow's milk was used. Injections were given in the gluteal muscles starting with one of 5 c.c. soon after admission, and repeating with 10 c.c. injections every other day for a maximum of approximately 10 doses. When necessary, sedatives and either cold or hot applications to the abdomen were used to relieve pain. Warm vaginal douches were given almost routinely as most patients had leucorrhea. They were used also for the beneficial effects of heat in giving comfort and assisting the absorption of the inflammatory exudate. An effort is made to eliminate infections of the external genitalia from which recurrent infections might occur.

Collections of pus were drained by posterior colpotomy 33 times in the 1021 admissions. Since protein injections have been used, many

masses, which formerly might have been drained through the culdesac, have been observed to absorb and disappear. If such masses bulge to much extent through the vault or toward the rectum, they are promptly drained to avoid rupture into the bowel, although when this happened cases invariably did well. As inflammation subsided uterine curettage was done 16 times to relieve excessive uterine bleeding.

#### PHYSICAL FINDINGS AFTER PALLIATIVE TREATMENT

Fig. 1 presents a summary of the cases according to the various degrees of inflammation at time of admission, and shows the results of palliative treatment, as indicated by physical findings. It demonstrates that, from 27 to 35 per cent of the cases, according to conditions for which they were treated, had no palpable pathology when

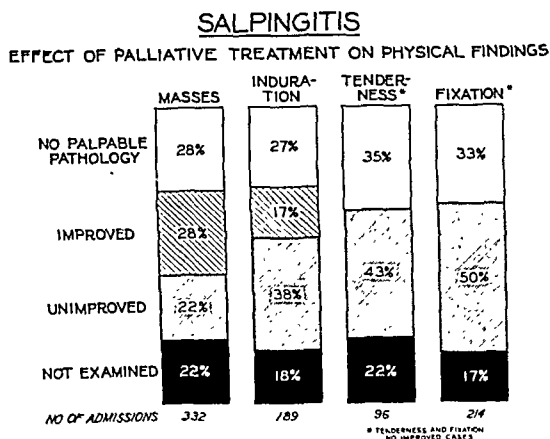


Fig. 1.

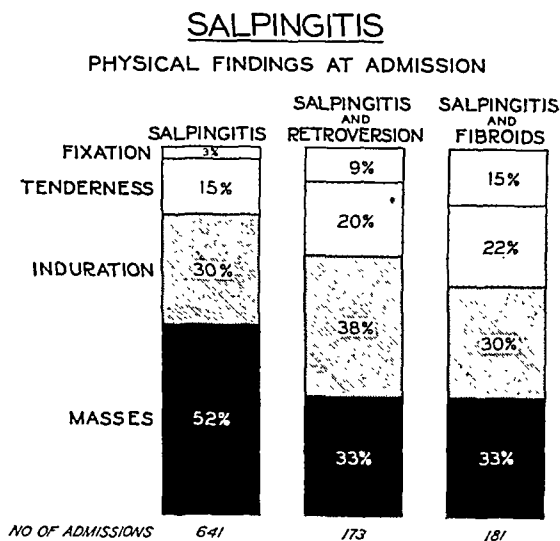


Fig. 2.

last seen. Many of those classified as "improved" or "unimproved" failed to heal while under observation, because they were followed too short a period of time to expect to get satisfactory results.

A high percentage of these cases, having persistent pathology, were symptom-free or had so few complaints that they would not return for examination.

Approximately one-fifth of the cases treated were not examined after being discharged from the hospital.

Fig. 2 shows the number of cases treated for salpingitis alone; those treated for salpingitis and retroversion, and those treated for myomas and salpingitis.

The types of inflammation which existed at time of admission are indicated in percentage. It will be noted that over one-half of the patients treated for salpingitis alone had adnexal masses, the most extensive type of inflammation, as compared to one-third of the cases

in the other two groups. This fact has an important bearing on the comparative results of palliative treatment in the groups as shown in Fig. 3.

In Fig. 3 it appears that cases with retroversion or myomas, in addition to pelvic infection, responded to treatment nearly as well as those with only salpingitis. This can be explained by the fact, previously noted in Fig. 2, that, as a group, patients admitted for salpingitis alone, had more severe inflammation in a higher percentage of cases, and were, therefore, relatively slower to heal. When patients with retroversion or fibroids develop salpingitis, symptoms are aggravated by the coexisting conditions, and hospital admission is therefore required for milder attacks of inflammation which respond more readily to treatment.

In general, it may also be stated, that healing of adnexal inflammation requires time in proportion to the degree of inflammation present. Hence, the longer a series of such cases can be followed the greater

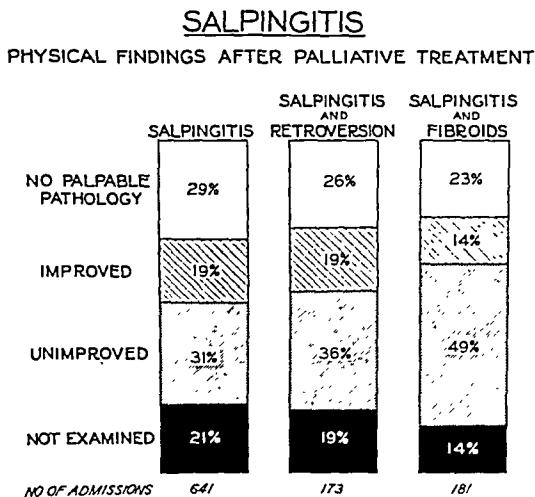


Fig. 3.

will be the percentage of spontaneous cures. Patients, when told that they have misplacements of their organs, or that they have uterine tumors, are, as a rule, more concerned about their welfare than those with only inflammation. Therefore, higher percentages of such cases can be followed for longer periods of time. For this reason the infections, from which they suffer, tend to heal more completely while they are still under observation.

End-results in cases of salpingitis alone would undoubtedly have shown, relatively, a higher percentage of spontaneous cures if the inflammation from which they suffered had been on the average as mild as in the other two groups, and if they could have been followed as satisfactorily.

In Fig. 4 the 641 cases, treated for salpingitis alone, are shown divided into two groups to determine the comparative success of pal-

liative treatment in acute and chronic cases. It will be noted that 30 per cent of acute cases and 28 per cent of the chronic ones had no palpable pathology after treatment. About one-half of the patients in each group had persistent pathology, although many of these cases, as indicated by physical signs, were distinctly improved.

In Fig. 5 the 641 patients, treated for salpingitis alone, were divided into two groups to determine the comparative success of palliative treatment of original and recurrent attacks of infection. It shows, as we might expect, that the original attacks responded more readily to treatment. However, 26 per cent of the patients, who had had recurrent attacks, when treated, became free from palpable pathology.

To summarize, results of palliative treatment, as shown in Figs. 1, 3, 4, and 5, indicate that from one-quarter to one-third of all patients became free of palpable pathology for as long as they could be followed; one-

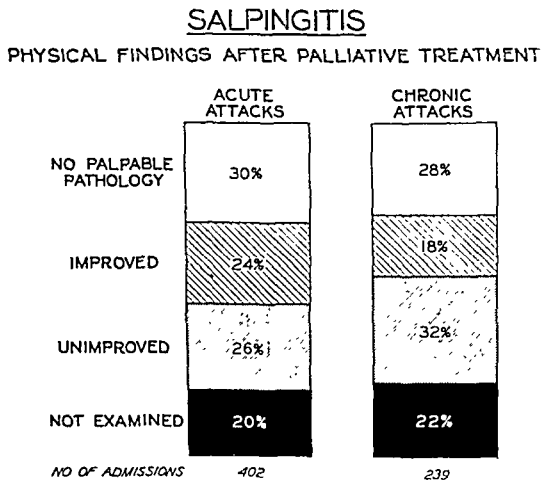


Fig. 4.

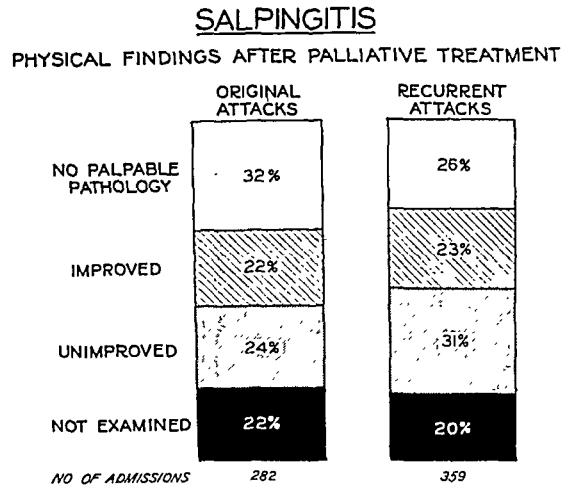


Fig. 5.

half had persistent pathology in spite of treatment and about one-fifth of the cases were never examined after being discharged from the hospital.

As we have no means of knowing which cases will heal spontaneously, we must consider it a possibility in all cases. As judged by physical findings alone, operation for salpingitis, without having tried palliative methods of treatment, would have been an injustice to nearly 30 per cent of the patients in any of the groups.

#### SYMPTOM RELIEF AFTER PALLIATIVE TREATMENT

Fig. 6 indicates the number of patients that had no palpable adnexal pathology after treatment and the percentage of these patients who were also symptom-free.

In the groups treated for retroversion and fibroids, as well as infection, the numbers of cases are too small from which to draw conclusions, but show the tendency for symptoms to persist after the infec-

tion has healed. In most cases persistent symptoms were those which might be attributed to the pathologic conditions which existed before infection occurred.

Fig. 7 presents a summary of cases which had persistent adnexal pathology after treatment. It shows the number of cases and the percentage, which in spite of failure of the infection to completely heal, were relieved of symptoms.

### SYMPTOM RELIEF

IN PATIENTS WITH  
NO PALPABLE PATHOLOGY AFTER TREATMENT

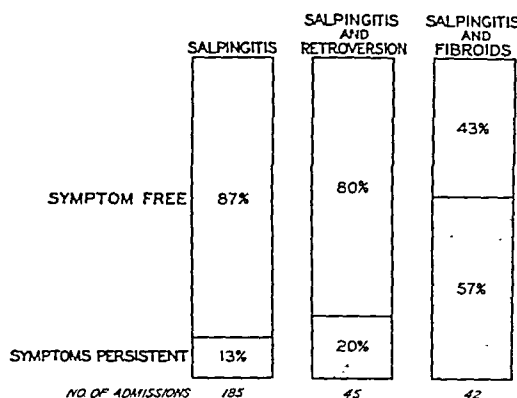


Fig. 6.

### SYMPTOM RELIEF

IN PATIENTS WITH  
PERSISTENT ADNEAXAL PATHOLOGY AFTER TREATMENT

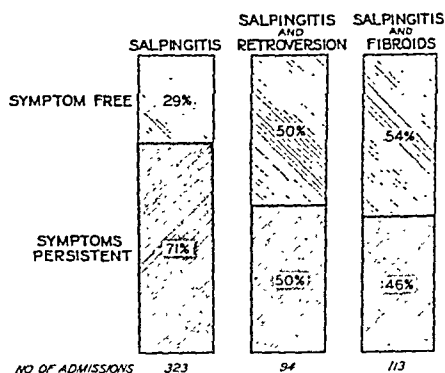


Fig. 7.

### FOLLOW-UP

PERIOD OF OBSERVATION

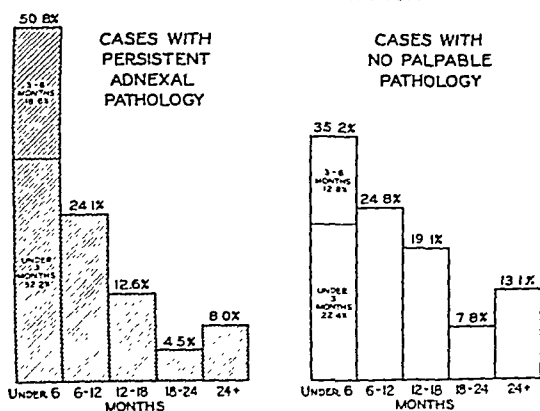


Fig. 8.

In the group of cases which had salpingitis alone, the smaller percentage of symptom-free cases can be explained again by the fact that this group, when admitted, had the most extensive pathology. Furthermore, for reasons stated above, it was the most difficult group to follow for a sufficient period of time in which to expect a high percentage of completely healed cases.

### FOLLOW-UP PERIODS OF OBSERVATION

Fig. 8 is an analysis of the periods of observation of all patients in the series who were examined after discharge from the hospital. After 1021 admissions 825 (80.9 per cent) were examined in follow-up clinics.

An additional 8 per cent were visited by the social service department. Many of these were working and well, and refused to return. Approximately 11 per cent could not be traced after having been discharged from the hospital.

Such a high percentage of women suffer from some degree of pelvic inflammation, at some time in life, that they frequently seem to regard it as a more or less natural condition which does not concern them much at the time, and even less when symptoms have been relieved. Hence patients with pelvic inflammation who are symptom-free are very difficult to keep under observation.

#### INDICATIONS FOR OPERATION

Operation may be necessary in the chronic stage of any attack of salpingitis to relieve persistent symptoms regardless of how much pathology remains. Conditions with persistent symptoms, which require operation, range all the way from easily separated peritoneal adhesions to adnexal masses, which may necessitate removal of both tubes and ovaries.

The difficulty of palpating adnexal adhesions may make it necessary, in some cases, in order to discover the exact cause of symptoms, to resort to exploratory laparotomy.

Patients in this series, that ultimately came to operation in the chronic stage, included:

1. Some of the patients who after treatment had both persistent symptoms and adnexal pathology.
2. Patients who were relieved when treated but continued to have recurrent attacks of pain and disability.

It seems that the only basis, on which to decide to operate upon a patient, is the degree of discomfort and disability which she has after conscientious palliative treatment.

Disability may be due to failure of the inflammation to completely heal or to the tendency to recurrent attacks.

In this series 113 patients came to operation after one or more admissions for palliative treatment. Of these operations 48 were for adnexal disease alone, 19 for salpingitis and retroversion, 40 for salpingitis and fibroids, 6 for salpingitis and cystic ovaries.

An exhaustive study of the cases in this series which had palliative treatment confirms the opinion so well expressed by Miller that "operation should be done not because sequelae of the acute attack exist but because they cause symptoms."

#### COMPARATIVE RESULTS OF OPERATION DURING THE ACUTE AND CHRONIC STAGES OF INFECTION

In a previous study of 977 cases, the results of operation, by 29 surgeons, during the acute stage of pelvic infection, were compared to those of operation during the chronic stage.



The determination as to whether cases were acute or chronic depended not only upon the usual clinical signs of inflammation, such as physical findings, fever, leucocytosis, and rapid sedimentation, but also upon microscopic study of tissue removed at operation.

Fig. 9 shows the results of this study, and shows conclusively that operation in the acute stage is dangerous, destructive and accompanied by too high a percentage of unsatisfactory end-results.

Conservative operations were those in which sufficient tissue was left so that the patient had the possibility of a future pregnancy.

#### COMPARATIVE END-RESULTS OF OPERATION AFTER ORIGINAL AND RECURRENT ATTACKS OF CHRONIC SALPINGITIS

Enthusiasts for operation in the acute stage of pelvic infection have advised early operation to avoid the destruction of tissue caused by prolongation of the infective process, or recurrent attacks.

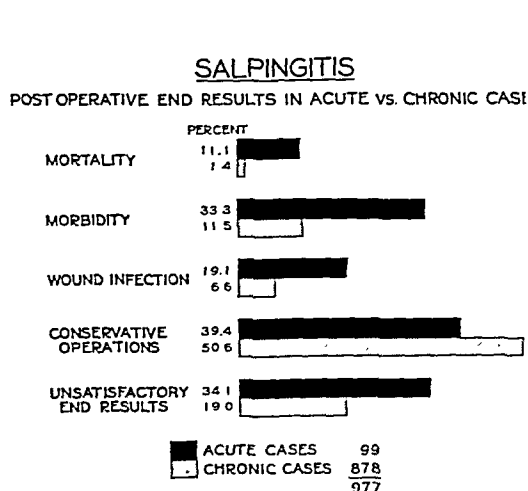


Fig. 9.

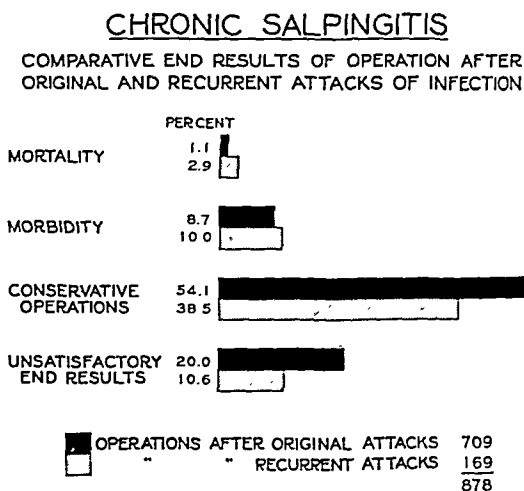


Fig. 10.

Fig. 10 indicates that the claims in regard to recurrent attacks are, to a certain extent, justified by the slightly increased postoperative mortality and morbidity, and the smaller percentage of conservative operations possible after recurrent attacks, as compared to those after the original attacks. These same surgeons have advised, at time of operation, a thorough excision of all diseased tissue. Dubose, one of the chief exponents of immediate operation in the acute stage, has published a series of patients in which only 35 of 164 (21.3 per cent) had conservative operations. It is interesting to compare this percentage with the 38.5 per cent of conservative operations which were done in this series in the chronic stage even after repeated attacks of inflammation. There is no sure way of predicting that a patient will have recurrent attacks. There can be no justification for doing destructive surgery in cases that with palliative treatment might never need operation.

## CONCLUSIONS

1. Adnexal disease tends to heal spontaneously. There is no means of knowing which cases will heal and which may need operation. All cases should therefore have the benefit of conscientious palliative treatment before operation is considered.

2. In the series of 1021 attacks treated by palliative methods approximately one-half (48 per cent) either healed completely or became free from symptoms so that operation was not necessary. One-third (32.7 per cent) persisted after treatment with symptoms and palpable pathology. Some of these latter patients had to be operated upon as their symptoms could not otherwise be relieved. Approximately one-fifth (19.1 per cent) of the patients treated were never examined after being discharged from the hospital.

3. Operation for salpingitis is recommended in the chronic stage if palliative treatment has failed to relieve symptoms, and for the disability of attacks which tend to recur in spite of treatment.

4. The practice of operating to cure salpingitis in the acute stage of the infection is absolutely condemned. Nearly one-half of such operations are unnecessary, if cases are first treated by palliative means. Furthermore, patients operated upon in the acute stage are subjected to unjustifiable mortality and morbidity, unnecessarily destructive surgery, and to too high a percentage of unsatisfactory end-results.

5. Operations in the chronic stage, even after recurrent attacks of infection, yield end-results which justify the greatest conservatism in the management of salpingitis.

## REFERENCES

- Simpson*: Surg. Gynec. Obst. 9: 45, 1909. *Curtis*: Surg. Gynec. Obst. 33: 621, 1921. *Nelson Loose Leaf Living Surgery* 7: Chapter 1, New York, 1928, *Thomas Nelson and Sons*. *Dubose*: Surg. Gynec. Obst. 33: 299, 1921. *Miller*: Surg. Gynec. Obst. 45: 110, 1927; AM. J. OBST. & GYNEC. 16: 793, 1928.

## BREECH DELIVERIES, WITH REFERENCE TO X-RAY MEASUREMENTS OF THE FETUS AND MATERNAL PELVIS\*

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THE problem of cephalopelvic adaptation or disproportion could easily be solved in any given case if we were able to measure directly the biparietal diameter of the fetal head and the conjugata vera of the maternal pelvis. Clinical methods of measurement, however, offer only an indirect approach to the true conjugate, and prac-

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tically no information whatever concerning the actual size of the fetal head. While it is true that in vertex presentations the problem of adaptation or disproportion can be determined, in borderline cases, by engagement or lack of engagement of the head either before labor or after a test of labor, the diagnosis of such adaptation or disproportion in breech presentations can only be made in the last phase of actual delivery. It is at this time that the obstetrician may learn to his dismay that disproportion exists, in which case the result is a still-born or fatally traumatized infant and, in many instances, severe damage to the mother.

In recent years Thoms,<sup>1</sup> Jarcho,<sup>2</sup> Johnson,<sup>3</sup> and Walton,<sup>4</sup> among others, have directed attention to methods of pelvic and cephalic mensuration by means of the x-rays. It is my belief that radiologic cephalometry and pelvimetry should, if controlled and accurate readings can be achieved, furnish us with information of the greatest value in predicting cephalopelvic adaptation or disproportion. This belief has led to the preparation of this paper, the results of which were attained after considerable trial and a fair amount of error. While the work was going on Dr. Stewart H. Clifford was engaged in the task of x-ray cephalometry in the determination of fetal maturity in utero, the results of which are now in process of publication.<sup>5</sup> These will be referred to from time to time in this paper for purposes of comparison.

On October 1, 1931, I undertook personal supervision of all breech deliveries on the house service of the Boston Lying-In Hospital, together with investigation of the x-ray measurements of fetal cranium and maternal pelvis in all cases of breech presentation where such measurements were practicable. This assignment expired on April 1, 1933, after a period of eighteen months. A series of 87 deliveries of presumably viable breech babies is presented, of which 39, or 44.8 per cent, were subjected to roentgen examination. In addition, 25 further cases of x-rayed breech presentations are to be tabulated, though they are not included in the assignment series for the following reasons:

- 11 were private cases of members of the hospital staff.
- 2 were delivered by breech extraction at home.
- 1 was delivered by breech extraction in another hospital.
- 4 were forceps deliveries of vertex presentations.
- 4 were normal deliveries of vertex presentations.
- 1 was delivered by version and extraction after becoming transverse.
- 2 were delivered by cesarean section.

Our results, collected and correlated, have furnished us with the data necessary to present this paper as a preliminary report of the value of x-ray measurements of fetus and maternal pelvis in breech presentations.\*

\*For lack of space, the extended tabulations could not be published.

## CLINICAL RESULTS

The clinical results of the 87 deliveries in the breech assignment series were as follows:

Delivered by breech extraction-----	85
Delivered by abdominal cesarean section-----	2
Because of demonstrated disproportion-----	1
Because of previous cesarean-----	1
Mothers discharged well-----	86
Mother discharged dead, shock and hemorrhage-----	1
Babies discharged well-----	79
Babies discharged alive with	
Fractured clavicle -----	1
Brachial nerve injury -----	2
? brachial nerve injury -----	1
Babies dead -----	4
Stillborn, congenital lues (autopsy) -----	1
Died nine days after delivery, hydrocephalus, spina bifida, fractured skull, intracranial hemorrhage (autopsy) -----	1
Died within one hour of delivery, trauma, undoubtedly intracranial injury (no autopsy) -----	1
Transferred to Children's Hospital day after delivery with ? traumatic transection of cervical cord. Cord decompressed, no intradural injury found, but large extradural clot. Eventual death with paralysis from compression myelitis -----	1

This series is not large enough in itself to occasion special comment. The gross fetal mortality of 4.6 per cent is not high for such a series, and could be accounted lower if we rule out the case of congenital lues and that of hydrocephalus. The maternal death and the death of the infant within the first hour of life are the result of manual dilatation of the cervix and breech extraction in a case where the cord was found prolapsed in a multiparous breech labor when the os was only 4 cm. dilated. We do not hesitate to criticize the obstetric judgment in this case, for the mother would have undoubtedly survived had no interference been practiced, whereas the infant would not have been more irrevocably lost than actually was the case following a difficult delivery.

## TECHNIC

For the purpose of making x-ray measurements the stereoroentgenometric technic described by MacKenzie Davidson<sup>6</sup> and Clayton R. Johnson,<sup>7</sup> modified in some measure to yield better controlled results, was selected. The theory on which this method is based is academically sound, and one of the principal purposes of this report is to discuss its practical value.

Let us consider, in connection with Fig. 1, that the construction  $OF$  represents either a radio-opaque body, or the distance between two bony and therefore radio-opaque landmarks. If an x-ray exposure is made from point  $A$ , the resulting shadow will be cast on the film at  $A'A''$ . If the same object is again photographed from another point of emanation of the ray, such as  $B$ , the resulting shadow will be cast on a second film at  $B'B''$ . From the two films thus obtained it is possible to reproduce schematically the crossed rays  $AA'$  and  $BB'$ , as well as the rays  $AA''$  and  $BB''$ , and to locate in space the points  $O$  and  $F$  at their respective intersections. Certain conditions, however, must be observed:

1. The tube-film distance,  $CC'$ , must be constant.
2. The shift of the tube,  $AB$ , must be constant.
3. The films on which the exposures are made must be accurately centered with relation to the midpoint of the tube-shift,  $C$ , and, therefore, to each other.
4. The dummy, or apparatus used for the schematic representation of the rays, must be constructed to reproduce the exact tube-film and tube-shift distances employed.

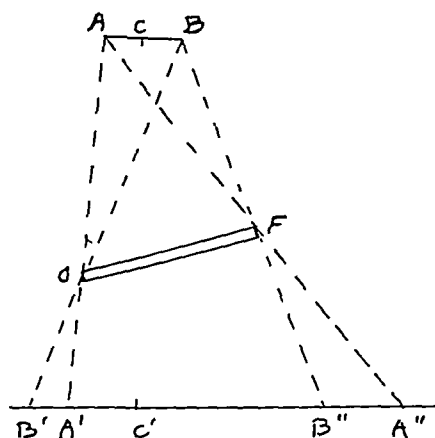


Fig. 1.— $OF$  is object to be measured. Rays from tube focus  $A$  cast shadow  $A'A''$  on film. Rays from tube focus  $B$  cast shadow  $B'B''$  on film. Distance  $AB$  is  $2\frac{3}{4}$  inches. Distance (perpendicular)  $CC'$  is 25 inches. When two films are accurately centered and superimposed on a view box the rays  $AA'$ ,  $AA''$ ,  $BB'$ , and  $BB''$  can be schematically reproduced by means of a dummy tube-shift, and the points  $O$  and  $F$  located in space; the distance  $OF$  as reproduced is measured directly, and gives the diameter of the object to be measured.

For making stereoroentgenometric exposures the patient is placed in the dorsal horizontal position on an ordinary x-ray table which is equipped with a stereoscopic tube-shift above, and a Potter-Bucky diaphragm, attachable to or detachable from the shift mechanism below. To measure the fetal head in a breech presentation, the tube should be centered midway in its longitudinal shift directly over the head, at or above the horizontal level of the maternal umbilicus. To photograph the pelvis, the tube should be centered about 2 in. above the horizontal level of the symphysis.

With the tube centered above the structure to be measured, the center of the film on which the exposure is to be made must be located to correspond exactly with the midpoint of the longitudinal tube-shift. This center point is determined by embedding in the midline of the radioscopic table two or three lead shot about 6 in. apart, in the direct plane of the longitudinal tube-shift; and by drawing transversely across the middle of the film cassette a wire, one end of which is permanently fastened through a hole drilled in the middle of the inner edge of the film-tray, the other clamped securely in a notch cut in the middle of the outer edge of the tray. The point of intersection of the shadow of this wire on the finished

film with a ruled pencil line drawn on the film through the shadows of the lead markers indicates the exact center of the film perpendicularly below the middle of the tube-shift.

As a control for the accuracy of the technic, and for the discovery of technical errors, two metallic rods, each 10 cm. in length, are attached over the lower abdomen of the patient in such a way that their shadows will appear on the developed film. The shadows should, naturally, be measured at 10 cm., but we have found our results satisfactory when these control measurements are accurate within 2 mm. of their real value.

With the tube centered over the fetal head and the tray containing the unexposed film in place, the Potter-Bucky diaphragm is released from its attachment to the shift mechanism and securely locked in its tracks. The tube is placed at one end of the stereo-shift. An exposure is made, using a Westinghouse Radiographic Heavy Duty Tube, with a  $4\frac{1}{2}$  to 5 in. spark gap, and an exposure of 50 ma. for from six to twelve seconds. The cassette containing the exposed film is removed, and a fresh cassette containing a new unexposed film is placed in the tray; the tube is now displaced to the other end of the stereo-shift and the second exposure is made. Two stereoscopic films are thus obtained of the fetal head, and two more are made in like manner to measure the maternal pelvis.

Experience has taught us that certain points in technic must be rigidly observed if accurate readings are to be secured; these, briefly, are as follows:

1. A constant 25 in. or 63.5 cm. tube-film distance is employed.
2. A constant  $2\frac{3}{4}$  in. or 7.0 cm. tube-shift is employed.
3. The apparatus must be rigidly locked when the longitudinal shift is made; otherwise, inertia may carry the tube beyond the shift-stop and completely invalidate the measurement obtained.
4. The Potter-Bucky diaphragm must be locked in its tracks, as otherwise in inserting the second film the carriage may be moved. This error will also invalidate the accuracy of the result.
5. The patient must not move during or between the two exposures. Ideally the fetus in utero should also remain motionless during this period: the great preponderance of our unsatisfactory readings have been due to the fact that we cannot control its intrauterine activity.

The two pairs of films are now developed and dried, after which they are ready for interpretation and measurement.

#### INTERPRETATION OF FILMS

For successful interpretation of cephalopelvic measurements the films should show sharp outlines of the fetal head and sharply defined end-points of the true conjugate. The cephalometric films should reveal a clear outline of either the frontal or sagittal plane of the head, from which may be obtained the biparietal or occipitofrontal diameter respectively. (Figs. 2 and 3.) The former is recognizable by its pear-shaped shadow, the mental point of the mandible, and the position of the orbits and the large fontanel; the latter by the shadow of the occiput, fontanels, brow, orbits, maxilla and mandible.

Experience has shown that in the majority of x-rays taken in accordance with the technic described the fetal head will be revealed in lateral or anteroposterior silhouette. Occasionally, the rays will reveal the head partially rotated (Fig. 4), or in a partially flexed coro-

nal plane, in which case neither the occipitofrontal nor the biparietal diameter can be accurately measured. More frequently one of the pair of films will show a measurable cranial outline, while in the other

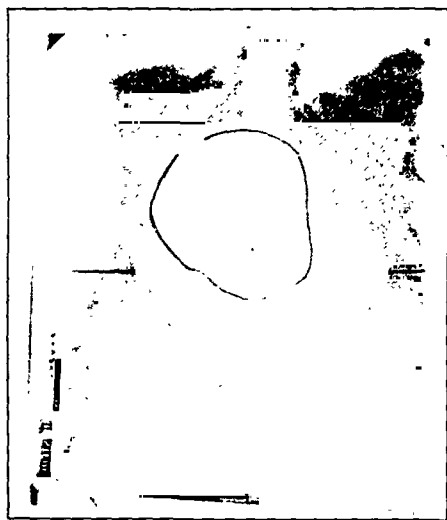


Fig. 2.



Fig. 3.

Fig. 2.—Illustrating satisfactory film of frontal plane of fetal head, from which the biparietal diameter may be obtained directly. This view was revealed in 8 per cent of our successful films.

Fig. 3.—Illustrating satisfactory film of sagittal plane of fetal head, from which the occipitofrontal diameter may be obtained directly. This view was revealed in 89 per cent of our successful films.



Fig. 4.—Illustrating oblique view of fetal head, from which neither biparietal nor occipitofrontal diameter may be read. Such a view, when obtained in a film which otherwise is technically successful, renders measurement unpredictable.

the outline will either be markedly displaced or differently shaped, due to movement by the fetus.

In our 62 breech cases investigated by stereoroentgenometry 24, or 37.2 per cent, were found to show marked movement of the fetal head

during or between exposures. In 38, or 62.8 per cent, presumably predictable measurements were obtained. Thirty-four of these, or 89 per cent, gave a satisfactory occipitofrontal silhouette, and 3, or 8 per cent, a clear anteroposterior view. One, or 3 per cent, was not measurable accurately because of the obliquity of the vertex plane.

These figures are few, but they correspond fairly accurately with those obtained by Clifford, who found 78 per cent of measurable results in 124 vertex presentations. We believe that the difference between 62.8 per cent and 78 per cent in the two series is due to the fact that the head is less apt to move during or between exposures when it is relatively splinted by the lower uterine segment than when it is free in the fundus.

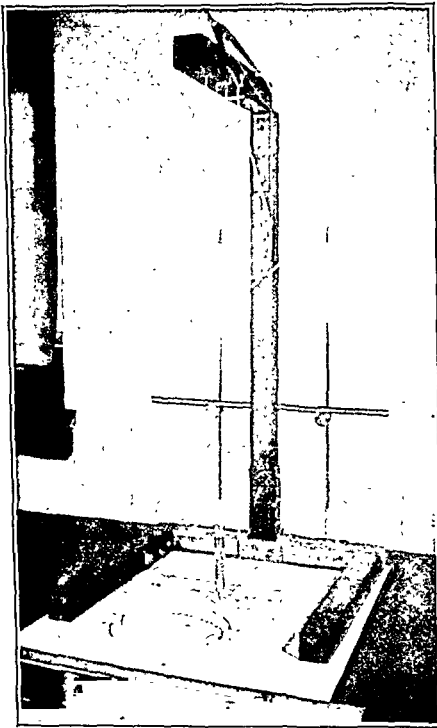


Fig. 5.

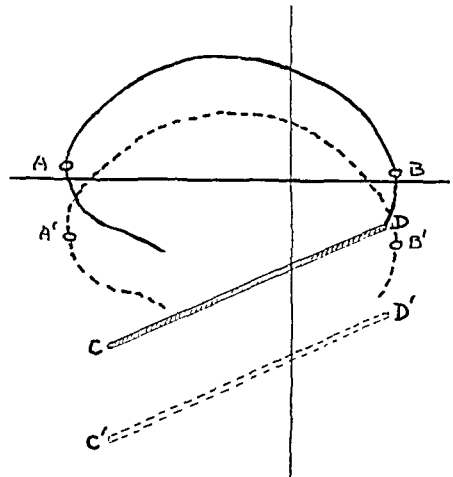


Fig. 6.

Fig. 5.—A dummy placed on superimposed and centered films, with plumb-bob of the schematic tube-shift perpendicularly over the central rod, with free ends attached to divider arms, will be used for schematic representation of the paths of the rays. The metallic pointers are ready for use.

Fig. 6.—Showing a pair of "A" class films correctly superimposed and centered for measurement. Points A and A', and B and B' represent the homologous end-points on the two films for the occiput and brow respectively. CD and C'D' represent the shadows cast by one of the metallic 10 cm. rods.

#### METHOD OF READING STEREOROENTGENOMETRIC RESULTS

For the purpose of schematic reproduction of the paths of the crossed rays from which we derive the desired end-points in space, a dummy, represented in Fig. 5, is employed. This consists of a base, a vertical upright, and a horizontal arm, the whole apparatus not unlike a gallows. To it are attached two pointed metallic rods



which work in sleeves and which are mounted on universal joints which may be fixed in any location within their range to spot a given point in space. Since this dummy must be constructed to a scale which reproduces exactly the tube-shift and the tube-film distance used in making the film exposures, it follows that the distance from the bottom of the apparatus to the under surface of the horizontal arm must be 25 in., and that the three gimlet holes bored through the horizontal arm to represent the  $2\frac{3}{4}$  in. tube-shift with the midpoint between must be exactly  $1\frac{3}{8}$  in. apart. A single elastic cord is threaded through the two-end gimlet holes corresponding to tube-foci *A* and *B*, and its free ends are attached to the two tips of a pair of dividers. Through the middle hole, corresponding to the midpoint of the shift, *C*, is threaded a cord to the end of which is attached a carpenter's plumb-bob.

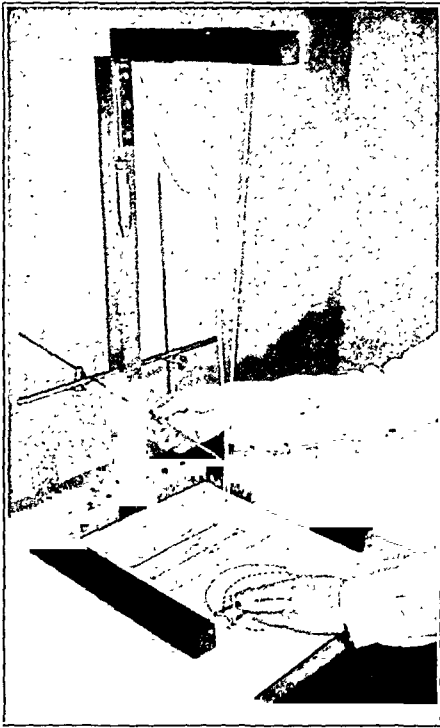


Fig. 7.

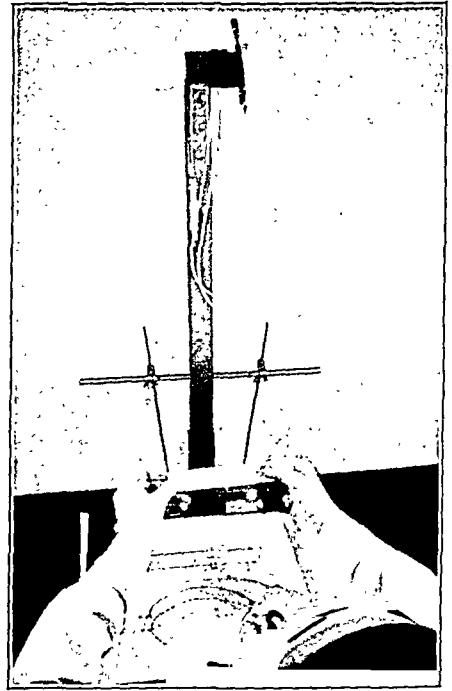


Fig. 8.

Fig. 7.—"Spotting" the crossing of the schematic rays in space, and locating the occiput. The operator is adjusting the tip of the pointer to the crossing of the cord, representing the crossing of the rays *AA'* and *BB'* in Fig. 1.

Fig. 8.—Both points, *O* and *F*, have been located and spotted in space. Reading the distance between the two tips of the pointers with an ordinary centimeter rule gives the distance *OF* direct.

The desired end-points are now located in space as follows (cf. Fig. 1):

1. The extremities of the diameter to be measured are marked on each film by piercing it at the desired points with a safety pin.

2. The films are superimposed upon one another on an illuminated view-box in such a way that the longitudinal pencil lines through the shadows of the lead markers coincide, and that the shadows of the transverse wires likewise coincide, thus accurately superimposing the centers of the two films. (Fig. 6.)

3. The dummy is placed upon the superimposed films in such a way that the longitudinal axis of the horizontal arm is parallel to and above the longitudinal axes of the films, and that the plumb-bob indicates that the midpoint, *C*, of the shift is perpendicularly above the centers of the films. (Fig. 5.)

4. With the elastic cord crossed once upon itself, the divider arms are adjusted in such a way as to bring the ends of the cord directly down upon the homologous end-points of the two films.

5. The tip of one metallic pointer is adjusted to spot this point of crossing of the cord in space, and is fixed in position. Thus rays  $AA'$  and  $BB'$  are schematically reproduced, and point  $O$  is located in space. (Fig. 7.)

6. Rays  $AA''$  and  $BB''$  are similarly reproduced, and point  $F$  spotted in space.

7. Measurement of the distance between the tips of the pointers gives the direct measurement of the diameter  $OF$ . (Fig. 8.)

One or both of the 10 cm. metallic rods are then measured as a control.

#### PRACTICAL APPLICATION OF STEREOROENTGENOMETRY IN BREECH SERIES

Since there is no academic reason why x-ray measurements cannot be carried out in any delivery series, our assignment of breech cases was undertaken with the purpose of accomplishing stereoroentgenometry in every case where it might prove feasible. The fact that we succeeded in doing this in only 39 of the 87 delivered cases is due to several factors, of which the following are most important:

1. A correct diagnosis of presentation must be made. Many of our cases entered the hospital in labor without the true position of the fetus determined. In not a few the diagnosis of breech was not made until relatively late in labor. In an occasional case a preliminary x-ray exposure was necessary to clinch the diagnosis of presentation.

2. The diagnosis of presentation must be made early enough to allow the taking of roentgenometric films before, or early in, labor. Conscious cooperation on the part of the patient to prevent movement on the table is indispensable, if satisfactory films are to be secured. Such cooperation is practically impossible if labor is active, whether or not analgesic drugs have been administered. Movement by the patient on the table during or between exposures precludes satisfactory measurements either of the fetal head or of the pelvis.

#### CLASSIFICATION OF FILM RESULTS

From the standpoint of obtaining satisfactory measurements of the fetal cranium by means of the x-ray, we have divided our films into three groups, as follows: "A" class, "B" class, "Zero" (0) class.

"A" class films comprise those in which no appreciable movement of the fetal head has taken place during or between exposures. This class may be recognized by superimposing the films with the longitudinal pencil lines coinciding, and sliding one film up or down upon the other until the two fetal head shadows come together. If they coincide exactly in outline, we are willing to predict the greatest accuracy of measurement. (Fig. 9.)

"B" class films comprise those in which slight lateral movement of the fetal head has taken place between exposures, but without flexion, extension, or rotation. By superimposing the films with the fetal head shadows coinciding exactly, we find that while the longitudinal pencil lines on the films do not coincide, they nevertheless remain parallel. If separation between the lines does not exceed  $\frac{1}{4}$  in., the measurement of the head can still be accurately determined. (Fig. 9.)

"Zero" class films comprise those in which marked lateral movement, flexion, extension, or rotation of the head has occurred during or between exposures. If flexion or extension has occurred, superimposition of the films with head shadows coinciding will result in crossing of the longitudinal lines. If rotation has occurred, the two head shadows cannot be made to coincide. In any such cases accurate measurements are impossible. (Fig. 10.)

This classification of films is based entirely upon experience with obtaining x-ray measurements of the fetal cranium which are absolutely or practically identical with caliper measurements of the infant taken within twenty-four hours after delivery. Since the films used to measure the maternal pelvis are separate from those taken to deter-

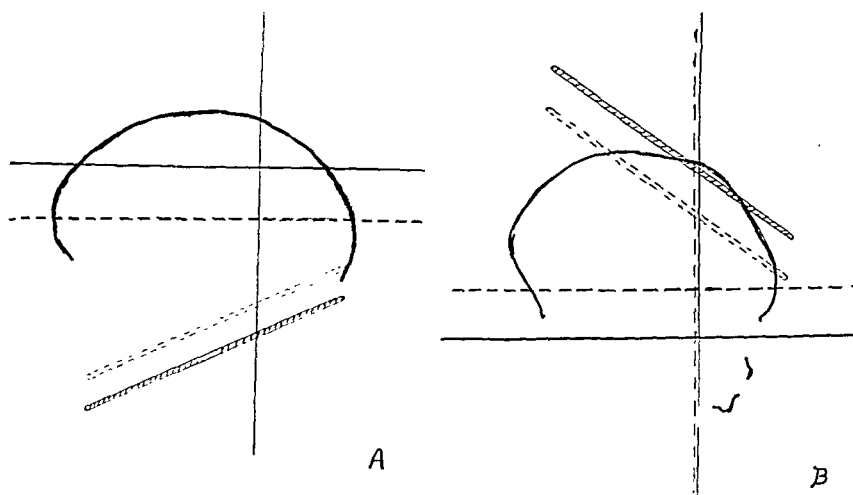


Fig. 9.—Illustrating method of determining "A" class and "B" class films. "A" class films give perfect coincidence of outline when superimposed with the longitudinal axes of the films coinciding.

"B" class films show the longitudinal axes closely parallel but not coinciding when the head shadows are accurately superimposed.

Both "A" and "B" class films give presumably accurate measurements.

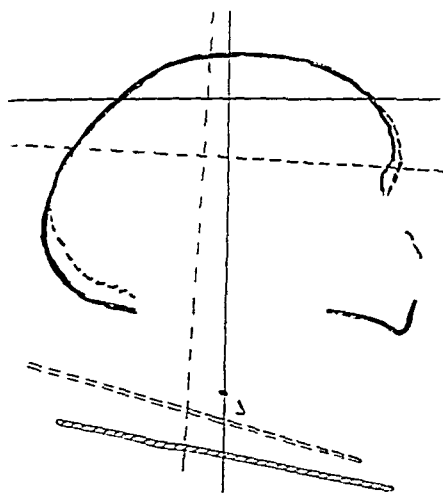


Fig. 10.—Illustrating "Zero" class film. Attempts to make the head shadows coincide are unsuccessful because rotation has occurred during or between exposures. In addition some flexion or extension has taken place, as shown by the crossing of the longitudinal pencil lines when heads coincide as nearly as possible.

This type of film is useless for determining cephalic measurements.

mine the fetal skull measurements, it follows that the classification as "A," "B," or "O" has no significance as an index of pelvimetric accuracy.

#### ACCURACY OF RESULTS OBTAINED BY X-RAY CEPHALOMETRY

Sixty-four breech cases were subjected to x-ray measurements of the fetal head in utero. Of these, 2 were measured by the Thoms technique, using a perforated lead plate; 62 were measured by stereoradiogenometry.

"A" class films obtained -----	22
(Controlled by postpartum measurement of baby's head----	17)
"B" class films obtained -----	16
(Controlled by postpartum measurement of baby's head----	14)
"O" class films obtained -----	24

In the 13 "A" class films where the baby's head was measured with calipers within seven days of the date of the x-ray measurement, it was found that 13, or 100 per cent, were accurate within 5 mm., and 12, or 92.3 per cent, accurate within 2 mm. This compares favorably with Clifford's findings that in 91 "A" class films, including both vertex and breech presentations, 99 per cent were accurate within 5 mm., and 97 per cent within 3 mm.

In the 8 "B" class films where the baby's head was measured within seven days of the x-ray measurement, it was found that 8, or 100 per cent, were accurate within 5 mm., and 6, or 75 per cent, within 3 mm. Clifford's comparative figures for 26 "B" class films give 100 per cent and 80 per cent respectively.

In the 4 "A" class and 6 "B" class films where the time differential was more than a week we would expect to find an increase in the actual measurement of the head over that obtained by x-ray proportionate to the time elapsed. The figures reported do not show any such definite proportion, and must wait for final interpretation until we learn more accurately the element of normal variability in the intrauterine growth of the fetal head. One can, however, postulate the probable accuracy of the x-ray figures in these cases from the controlled measurements obtained by Clifford in cases where pregnancy was interrupted shortly after roentgenometry for therapeutic reasons; such measurements are included in the 99 to 100 per cent successful readings in the 117 cases referred to in the two preceding paragraphs.

At the outset of our work, before we understood fully that "Zero" class films could not be expected to give accurate results, we went through the motions of determining measurements in many specimens of this class. The discrepancies obtained between x-ray and true measurements amounted in some cases to 29 mm., and it was not long before we recognized the inaccuracy of readings from "Zero" class films on theoretical as well as practical grounds. We have, therefore, given up all attempts to predict cephalic measurements in these cases.

The foregoing figures indicate that in this series of breech presentations the initial measurement of the fetal head in utero was presumably accurate in 62.8 per cent of the cases. In those in which no satis-

factory measurement could be obtained the error was due in the vast majority of instances to movement of the fetus, and in a small proportion to the presentation of an oblique diameter of the head to the path of the rays.

Scrutinizing the "presumably accurate" measurements in 38 cases we find:

Accurate within 5 mm., controlled by actual measurement of the baby's head less than seven days after roentgenometry----	21 cases (55.2%)
Possibly accurate, controlled by actual measurement of the baby's head from eight to forty-two days after roentgenometry -----	10 cases (26.3%)
Possibly accurate, uncontrolled by actual measurement, from eight to seventy days before delivery-----	6 cases (15.8%)
Probably inaccurate, oblique view, uncontrolled by actual measurement of the baby's head, forty-eight days before delivery--	1 case ( 2.6%)

To most of our successful x-ray measurements of the fetal head the objection may be raised that the reading reported is for the occipitofrontal diameter, whereas the essential diameter to be measured is the biparietal. This objection is important, since only 8 per cent of our successful films give a direct reading of the latter. We adopted, however, at the outset of the work, pending confirmation of his results by our own experience, the rule suggested by Thoms for the computation of the biparietal diameter from the measured occipitofrontal. His figures, gleaned from 149 cases, are here tabulated, with ours from 75 cases placed beside them in parentheses:

For O.F.D. of 12.5, subtract 2.5	for B.P.D. (2.7)
For O.F.D. of 12.0, subtract 2.5	for B.P.D. (2.2)
For O.F.D. of 11.5, subtract 2.0	for B.P.D. (1.4)
For O.F.D. of 11.0, subtract 1.75	for B.P.D. (1.5)
For O.F.D. of 10.5, subtract 1.5	for B.P.D. (1.25 ?)

In other words, our technic shares the disadvantage common to all methods so far reported for cephalometry, that the essential diameter to be measured for purposes of comparison with the pelvis through which it has to pass must, more often than not, be computed indirectly. This limitation is recorded with regret as a serious obstacle to the achievement of mathematically accurate results.

#### ACCURACY OF RESULTS OBTAINED BY X-RAY PELVIMETRY

In the pelvimetric phase of our work we have been faced with the well-nigh insuperable difficulty of securing control measurements of the conjugata vera for purposes of comparison. It is impossible to measure this diameter with mathematical accuracy by any means other than a rule, caliper, or other metric device, at autopsy. In the one

case, which, because it was not a breech delivery, is not included in our series, in which postmortem examination was done on a patient whose pelvis had previously been measured by x-ray, the radiologic conjugata vera and the actual conjugata vera tallied identically at 12.0 cm. The next most accurate method of measuring the true conjugate directly is at the time of cesarean section or other laparotomy, and we were fortunate enough to find one case in our assignment series in which these conditions were fulfilled, the x-ray conjugata vera tallying exactly with the measured diameter at 10.0 cm.

Realizing at the outset of our investigations the impossibility of achieving accurate control measurements for our x-ray mensuration of the true conjugate, we decided upon recording the diagonal conjugate in the cases in our breech assignment series. This was easily done, because all cases were delivered under general anesthesia, and the readings of the diagonal conjugates obtained were tabulated. In 29, or 33 per cent of the breech series, satisfactory x-ray measurements were obtained and checked against determinations of the diagonal conjugate. In one additional private case the controlled information is at hand. Eighteen, or 60 per cent of the cases, showed the diagonal conjugate greater than the x-ray conjugata vera, of which 10, or 33 per cent of the total number, gave a reading from 1 to 2 cm. greater. Ten, or 33 per cent of the cases, showed a measured diagonal conjugate less than the x-ray measurement of the true conjugate.

We have no explanation at present to offer to account for these discrepancies, save that we are uncertain, in some cases, as to the exact location of the promontory in the film. The top of the symphysis is easy to locate, but the shadow of the promontory, when taken from directly above with the patient recumbent, is often ill defined in outline and poorly contrasted against the shadow of the sacrum below. This bad differentiation may be lessened by taking the exposures with the patient in the semireclining position as advocated by Thoms, since in this posture the pelvic inlet is brought closer to the horizontal plane and the promontory is more sharply defined. This was carried out in a few of our patients postpartum, but we found it impracticable in the full-term gravida, because of the higher dosage of rays required to penetrate the greater thickness of the intervening tissues and fluid, and because the protrusion of the abdomen tended to interfere with the tube-shift.

On the other hand the manual measurement of the diagonal conjugate is also, at best, only an approximation. We feel strongly that there is room for much more work with accurately controlled x-ray pelvimetry, before we can place entire reliance on measurements obtained in this way.

VALUE OF COMBINED X-RAY CEPHALOMETRY AND PELVIMETRY IN  
BREECH DELIVERY

It would be gratifying to me to conclude this article with a series of reported cases in which the use of antepartum x-rays pointed the way clearly toward cesarean section rather than breech delivery through the pelvis because of disproportion. Such a series cannot be adduced from the work on this subject done in our clinic to date. We can, however, report one such case, which seems well worth outlining in some detail:

Mrs. F. reported to the clinic on April 25, 1932. She was essentially a primigravida, in that her only previous pregnancy had terminated in a two months' abortion in 1929. Confinement was expected August 26. Her clinical measurements on her first visit were as follows: intercrystal 24.5 cm., interspinous 21 cm., external conjugate 17 cm., bisischial 7 cm., promontory not reached on vaginal examination. Antepartum examination on August 31 showed a breech presentation, R.S.A. X-ray measurements on the same date gave "A" class films, from which the occipitofrontal diameter measured 11.8 cm. (estimated biparietal 9.3 to 9.8 cm.), and a true conjugate of 10.0 cm.

Because of the borderline type of pelvis, and the close approximation of the estimated biparietal diameter to the x-ray true conjugate, an elective cesarean section was done Sept. 1. Immediately before operation, with the patient under anesthesia, the diagonal conjugate was determined to be 11.5 cm. At operation the conjugata vera was measured from within at 10.0 cm. The baby was born in good condition, weighed 7 pounds 12½ ounces, and the maternal measurements showed an occipitofrontal diameter of 11.9 cm. and a biparietal diameter of 9.7 cm. Mother and baby discharged well on Sept. 16.

Acknowledgment is made to Dr. Stewart H. Clifford, whose paper on this subject will be published in a subsequent issue of the JOURNAL. Practically all the refinements of technic which have contributed so much to accuracy and to control of results, are due to Dr. Clifford's supervision.

## SUMMARY AND CONCLUSIONS

1. Stereoroentgenometry provides a method for antepartum measurement of the fetal cranium, and for measurement of the maternal conjugata vera.

2. In 62.8 per cent of the breech presentations with which this paper deals, presumably accurate measurements of the fetal head were obtained at the first attempt. Thirty-seven and two-tenths per cent of the cases were unmeasurable because of fetal motion in utero.

3. Control measurements of the baby's head, taken after delivery and within seven days of stereoroentgenometry, indicated that the measurements were accurate within 5 mm. in 100 per cent of the cases, and within 3 mm. in from 75 to 95 per cent.

4. Stereoroentgenometric measurement of the conjugata vera is difficult to control with any degree of mathematical accuracy. Such

measurements have been confirmed in the 2 cases in our clinic in which the patient came to operation or autopsy, and in which control measurements were possible.

5. Stereoroentgenometry has been of value in one case in our series, in which it gave confirmatory indication for the performance of elective cesarean section in a primiparous breech presentation.

6. A reasonable expectation may be entertained that repeated x-ray investigation of breech presentations before delivery may, with greater experience, yield a higher proportion of accurately measurable results.

475 COMMONWEALTH AVENUE.

#### REFERENCES

- (1) *Thoms, Herbert*: AM. J. OBST. & GYNEC. 4: 257, 1922; *ibid*: J. A. M. A. 85: 253, 1925; *ibid*: J. A. M. A. 92: 1515, 1929; *ibid*: AM. J. OBST. & GYNEC. 20: 807, 1930; *ibid*: J. A. M. A. 95: 21, 1930. (2) *Jarcho, J.*: Am. J. Surg. 15: 419, 1931. (3) *Johnson, Clayton R.*: Am. J. Surg. 8: 151, 1930. (4) *Walton, H. J.*: Surg. Gynec. and Obst. 53: 536, 1931. (5) *Clifford, Stewart H.*: The X-ray Measurement of the Fetal Head Diameter in Utero. (To be published.) (6) *MacKenzie, J. Davidson*: Localization by X-rays and Stereoscopy, New York, 1916, Paul B. Hoeber. (7) *Johnson, Clayton R.*: Loc. cit.

#### THE ALLEVIATION OF PAIN IN OBSTETRICS\*

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IT IS very gratifying to one who has long been interested in the alleviation of pain in obstetrics, and who has pioneered a little in some phases of that subject, to note the increasing interest of our profession in this important field; but it is sometimes alarming to see the manner in which this alleviation of pain is accomplished.

From an attitude of apparent indifference to the suffering of the parturient woman, some have turned to an oft-expressed "ideal of painless labor." They have attempted, by massive doses of unintelligently administered drugs, to obtain amnesia, analgesia, and anesthesia without thought of the not-infrequent deleterious effects on the mother and baby. Too often has each new drug that has a sedative or hypnotic action been seized upon as the perfect agent for relief of pain in childbirth; too often have such physicians, with no thought of the physiologic action of the drugs they were so indiscriminately using, jeopardized the lives of both the women in labor and their offspring.

Relief from pain in labor is one of the greatest assets to the well-being of the average mother, but let him who gives that relief never lose sight of the fact that pain presents peculiar problems to the obstetrician. With the thought of the comfort of his patient in mind,

\*Presented at a meeting of the Watertown District Medical Society, Watertown, South Dakota, August 9, 1932.



he must consider her safety and the safety of her baby. He must distinguish between analgesia and anesthesia, between hypnosis and narcosis. He must learn that the woman in labor does not enjoy an immunity to injudicious medication but rather that she is highly susceptible to it.

It is possible to alleviate safely the pain of labor. It is possible to make of labor an incident rather than an ordeal. Certain knowledge is essential to do this intelligently. This essential knowledge may be called the "A, B, C" of pain relief in labor.

*A. Know Your Patient, Physically and Emotionally.*—When she comes to you for prenatal care, take time to study her as an anesthetic as well as an obstetric risk. Note those factors which might, for example, make her a poor risk for a general anesthetic. Study her reactions to the common discomforts of pregnancy. Learn of her mental attitude toward her approaching labor. Assure her that you have ways for making labor easy. Then, after you have studied her during the prenatal period, formulate a plan by which you propose to relieve her of pain in labor. Sometimes that plan will have to be changed and sometimes no plan will suggest itself until the patient is seen in labor, but a careful analysis of each patient along the lines suggested will help to simplify the problem.

I want to emphasize the importance of individualizing each patient. The obstetrician who does the best by his patients in the matter of pain relief is the one who familiarizes himself with the action of the drugs to be used and then selects the drug or drugs best suited to the individual patient. In other words, he fits the drug to the patient, not the patient to the drug. The failure of most so-called "methods" for relieving the pain of labor is due to the fact that they are not flexible enough to allow for the individual variations encountered.

*B. Know the Action of the Drugs You Use.*—I once heard a doctor state that he never used scopolamine in labor because it produced "blue babies." Instead he ordered morphine sulphate in one-fourth grain doses "when the pains became severe, and this could be repeated if necessary." It scarcely needs to be added that he did not escape cyanosis in the newborn with this technic!

Several years ago, when the injectable barbiturates first came into use, I saw a near fatality in obstetrics because the attending physician did not know that two powerful respiratory depressants, the barbiturates and morphine, should not be used in close association in the same patient.

Nitrous oxide oxygen has been used in obstetrics for years. The rapidity of its action, plus the prompt recovery, has made it particularly valuable for the so-called intermittent type of anesthesia in labor. We need to remember that it can become one of the most dangerous of all anesthetics when cyanosis is allowed to occur. Some physicians

and some anesthetists even now mistake asphyxia for anesthesia. Lundy's admonition to "keep the patient pink" is of paramount importance. While a transient cyanosis may do no harm, any prolonged cyanosis is dangerous.

*C. Know the Mechanism of Labor and the Progress Each Individual Patient Is Making.*—The latter requires the closest attention of the obstetrician. It cannot be left to chance or to a set of routine orders. I do not believe it is good obstetrics to have a "blanket" set of orders for analgesia and anesthesia and to try to cover each patient with it. Pain relief in labor requires more, not less, of the obstetrician's time. It requires a more accurate diagnosis of presentation and position, more careful study of the mechanism of labor and a more careful supervision of the patient. Unless one is prepared to give that added time and study he should not attempt it.

For purposes of illustration, I have reviewed the records of my last 1000 consecutive deliveries where the fetus had reached the period of seven months' gestation, to show that no one method of pain relief was applicable to all. These were all hospital patients.

Three main groups of analgesic and anesthetic agents were used:

- Group I. Those in whom pantopon scopolamine was used as the basic anesthetic agent; including 347 primiparas and 259 multiparas.
- Group II. Those in whom a barbiturate was used as the basic anesthetic agent; comprising 59 primiparas and 112 multiparas.
- Group III. Those in whom inhalation anesthesia only was employed; 50 primiparas and 173 multiparas.

There was one maternal death, a multiparous patient with decompensated mitral stenosis who had had no prenatal care and who died thirty-six hours after labor of pulmonary edema. Her baby survived. Ether anesthesia was used for thirty-five minutes.

The gross fetal mortality was 28 or 2.8 per cent. A dead fetus before onset of labor was noted in 14 or 1.4 per cent. Deformity, incompatible with life occurred in 2 or 0.2 per cent. The corrected mortality therefore was 12 or 1.2 per cent.

There is but one rule to follow in determining the time for beginning analgesia or anesthesia, namely, the suffering of the patient. Something is given for the relief of pain just as soon as the patient begins to feel uncomfortable, no matter how early in labor. What should be given depends upon a thorough knowledge of the "A, B, C" as outlined earlier.

I do not recommend any one "method" for the relief of pain in labor. It is important to remember that the perfect analgesic or anesthetic agent has not yet been discovered. At the present time a combination of drugs seems to possess advantages over single agents in labor.

## ORDINARY TECHNIC IN AVERAGE NORMAL LABORS

When the patient first begins to complain of pain, she is given pantopon, 0.011 gm. and scopolamine stable (Roche), 0.00066 gm. by hypodermic or two capsules of sodium amytal (0.396 gm.) or two capsules of pentobarbital sodium (0.198 gm.) by mouth. The room is darkened and all unnecessary manipulation of the patient is prohibited. From forty-five minutes to one hour later she is given scopolamine stable (Roche), 0.00066 to 0.00033 gm. by hypodermic, depending upon her reaction to the first medication. At intervals of from one to two hours thereafter, she is given scopolamine stable (Roche) 0.00033 gm. by hypodermic until the first stage is well advanced. At this time sodium amytal or pentobarbital sodium in 0.5 gm. dose in 5 c.c. of sterile distilled water is given intramuscularly into the deltoid or the same dose of the barbiturate may be administered as a retention enema. This produces a condition bordering on obstetric analgesia in from twenty to thirty minutes and its effect persists for from one to two hours.

In some instances delivery may be effected without the aid of any inhalation anesthetic but usually nitrous oxide oxygen, ethylene oxygen, or ether is added for the actual delivery. One should caution the anesthetist, when an inhalation anesthetic is to be given to a patient who has had a barbiturate, that such a patient needs only about half the anesthetic that would be required by a patient who had not had this basic preparation.

UNSATISFACTORY RESULTS OF THE ABOVE TECHNIC IN AVERAGE  
NORMAL LABORS

1. *The Intravenous Administration of the Injectable Barbiturates.*—The effect is too abrupt. The initial drop in blood pressure is sudden and, sometimes, alarming even though the recommended rate of injection is not exceeded. If given early in labor the contractions frequently cease. If given in the second stage larger doses are required to secure sedation and one may find himself with a patient who is under a general anesthetic, the effect of which cannot be terminated.

2. *The Use of the Barbiturates Followed by Morphine.*—Clinically, the barbiturates and morphine are known to be respiratory depressants. I have never seen evidence of asphyxia neonatorum in cases where the mother has been given barbiturates alone, nor in cases where scopolamine and the barbiturates have been used. I have seen instances where babies have been cyanotic at birth and have remained so for several hours following the administration of even 0.008 gm. of morphine to the mother after she had been given an initial dose of some barbiturate earlier in labor.

The barbiturates seem to hasten the softening and dilatation of the cervix when used in doses not exceeding 0.5 gm. orally, intramuscularly or by rectum. If the use of morphine is contemplated during labor it should be given first, not within three hours of the expected birth, and the dose should not exceed 0.008 gm.

3. *The Use of the Barbiturates as the Exclusive Analgesic and Anesthetic Agents Throughout Labor.*—My experience has been that the required dosage is too large to warrant this procedure. One must give almost a depressant dose to produce sufficient anesthesia. The anesthesia produced is not controllable.

## MODIFICATION OF TECHNIC IN ABNORMAL LABORS

1. *The Occipitoposterior Position.*—The barbiturates are very effective in relieving the annoying backache of the early first stage. Softening and dilatation of the cervix seem to be hastened. I have had my best results with sodium amytal given orally. An initial dose of pantopon, 0.011 gm. adds to the effectiveness of the sodium amytal. Scopolamine may be used when labor is well established.

2. *Breech Labors.*—A technic similar to that used in occipitoposterior positions is effective.

3. *Elective Cesarean Section.*—The barbiturates act ideally as the basic anesthetic. Sodium amytal, sufficient to insure eight to ten hours' sleep, is given the night before operation and half the night dose is given in the early morning, three hours before the patient goes to surgery. Ethylene oxygen is the general anesthetic of choice. The patients sleep most of the day of operation and abdominal pain is rare.

4. *The Barbiturates in Eclampsia.*—In my opinion, an imminent or actual eclamptic seizure offers the one indication for the use of the barbiturates intravenously. Their action is definite, prompt, and gratifying. I have not found that hypertension is a contraindication, but the injection must be made slowly or the preliminary drop in blood pressure may prove excessive. I recommend sodium amytal in from 0.5 to 1 gm. doses, given in 10 per cent solution in sterile distilled water at a rate not to exceed 1 c.c. per minute. Hypertonic dextrose solution is given intravenously following the sodium amytal injection.

#### SUMMARY

1. Adequate pain relief in labor must be based on a careful individual study of each patient and a careful study of the drugs employed. A program of pain relief requires more, not less, of the obstetrician's time.

2. There is no one "method" which gives adequate relief in all cases. The best results are obtained by the use of a combination of drugs.

3. Every parturient mother has a right to relief of pain in labor. That relief can be given safely if the physician is willing to study each individual patient and fit the drugs to the patient, not the patient to the drugs.

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## REPORT OF TWO CASES OF GRANULOSAL CELL TUMORS OF THE OVARY

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THE infrequency of occurrence of this type of tumor warrants the report of the following 2 cases; only 7 cases have been reported in this country, and only about 150 appear in the entire literature.

CASE 1.—Mrs. H. L., No. 49340, aged thirty-eight, para vi, gravida ix (three intentional abortions). Menopause began six years ago (aged thirty-two), following the last abortion. There was no bleeding or spotting since that time. No operations were performed. The patient was first seen in November, 1931, when, during a general physical examination, slight adnexal enlargement was felt, and a diagnosis of probable chronic bilateral salpingo-oophoritis was made. As the patient had no pelvic complaints, no operative interference was thought to be indicated. On return visits, enlargement of the left ovary was noted, and, in August, 1932, it was thought to be about 7 cm. in diameter and felt quite hard. A diagnosis of solid tumor

of the left ovary was made and a bilateral salpingo-oophorectomy and total hysterectomy were done. The postoperative convalescence was uneventful.

*Gross Description of Specimen.*—The uterus measured 7 by 4½ by 3 cm. Its surface was smooth, and the cervix was moderately eroded, with a bilateral laceration.

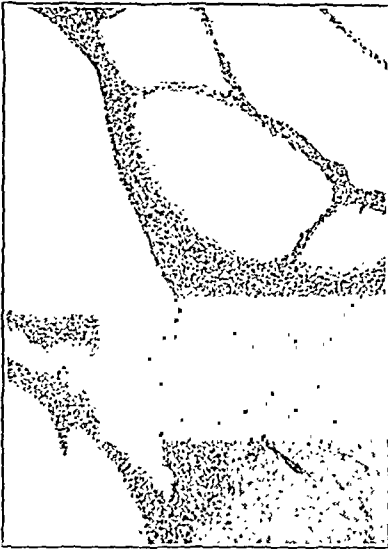


Fig. 1.

Fig. 1.—Multiple cysts with walls of solid granulosa-like cells. (×120)

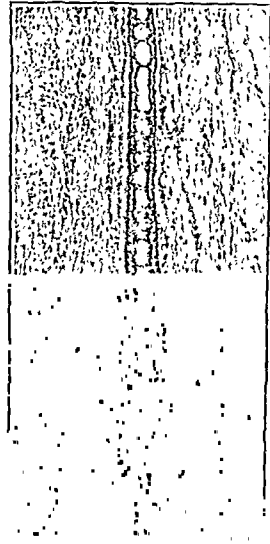


Fig. 2.

Fig. 2.—Invasion of dense fibrotic tissue by granulosa cells, showing numerous follicle-like structures. (×120)

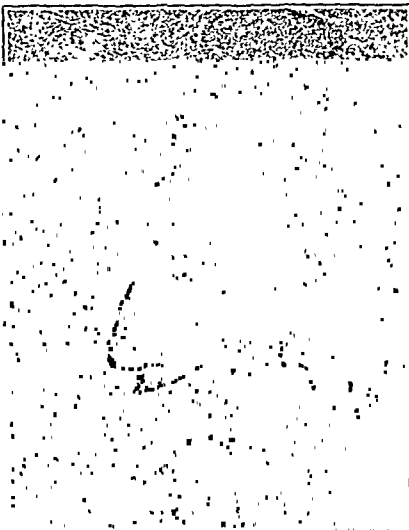


Fig. 3.

Fig. 3.—Typical island of granulosa cells. (×120)



Fig. 4.

Fig. 4.—Endometrium showing variations in size of glands and hyperplasia. (×60)

tion. The right tube and ovary were attached to the uterus and appeared entirely normal externally and on cut section. The uterine cavity was 5 cm. in length, with uniform walls. The endometrium was not over 2 mm. in thickness at any point. The left ovary was round, measuring 7 cm. in diameter, and of firm consistency, the outer pole being almost cartilaginous. The tube was adherent to one surface, but

was otherwise normal. On cut section, the ovary was found to be divided into two portions, the larger of which occupied two-thirds of its substance. It was made up of a dusky yellow material, about the consistency of gelatin, and contained numerous small cyst cavities. The smaller portion, or the remaining one-third, was composed of very hard white fibrous tissue, with occasional small cysts which contained clear serous fluid.

*Microscopic Description.*—The sections of the ovary were largely composed of cells resembling granulosa cells. They were closely packed together, with very little stroma. Throughout all of the masses of these cells a tendency to form small circular structures, with a single layer of cells resembling the primordial follicles, was noticed, but no ova were seen. The cyst cavities were mostly lined by multiple layers of these same cells, and, throughout the cortex of the ovary, small groups of cells, closely packed together, were frequent. The staining of these cells in the smaller groups was much darker than of the same cells in the large mass. Several cells containing mitotic figures were seen in every high power field. At one pole of the ovary was an area of dense fibrotic connective tissue, containing occasional



Fig. 5.

Fig. 5.—High power of any area in Fig. 3. Note single layer of cells forming follicle structure. No ova are seen. ( $\times 1225$ )

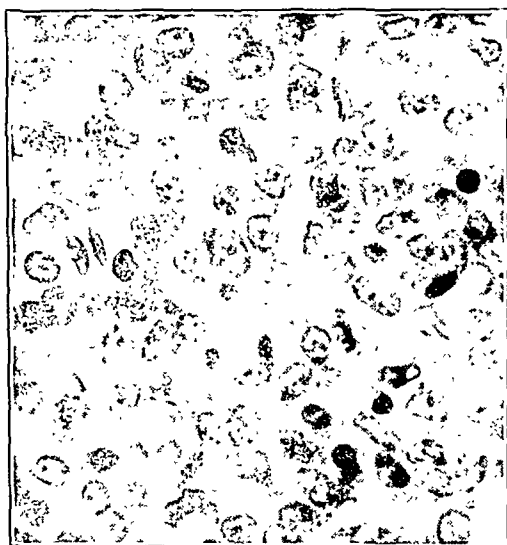


Fig. 6.

Fig. 6.—High power of solid mass of granulosa cells, occasional mitotic figures. ( $\times 1225$ )

small structures resembling follicles, larger areas of granulosa-like cells invading the stroma, and small cysts, lined by multiple layers of the same cells. (There were no unusual findings in the right ovary.)

The endometrium contained glands varying greatly in size as some were considerably enlarged and cystic, but there was no hyperplasia of glands or cells and the cytogenic stroma and myometrium were normal.

CASE 2.—Mrs. T. L., No. 79258, aged twenty-seven, para ii, gravida ii. Menses began at the age of twelve and were regular until after the birth of her second baby, which was sixteen months prior to her present admission to the hospital. The patient gave a history of amenorrhea for the past sixteen months. Pelvic examination revealed an old deep perineal laceration, second degree rectocele and cystocele, and a deeply lacerated and eroded cervix prolapsed to the introitus. The corpus uteri was normal in size, but retroverted. The right adnexa were negative but there

was a left adnexal tumor of firm consistency and about 7 cm. in diameter. The tumor was diagnosed as probably a granulosa cell tumor because of the menstrual history and a unilateral solid ovarian tumor. The Aschheim-Zondek reaction was weakly positive.

At operation the tumor was found to be entirely free and the opposite adnexa negative. A left salpingo-oophorectomy, uterine suspension, trachelorrhaphy and anterior and posterior colporrhaphy were done. The postoperative convalescence was uneventful and the patient left the hospital on the twelfth day.

*Pathologic report:* The left ovary was 7 cm. in diameter. The serosa was smooth with marked capillary congestion. Cut section through the ovary showed it to be made up, partially, of small multilocular cysts, filled with a clear light yellow fluid, and, partially, of a granular soft yellow substance, which completely filled the locules.

*Microscopic sections* revealed practically the identical structures and cellular arrangement as described in Case 1, i.e., tubules, solid masses and numerous cysts lined with granulosa cells.

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## AN INTERNAL OUTLET PELVIMETER

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IN A PREVIOUS communication<sup>1</sup> I presented a pelvimeter for the measurement of the bispinous diameter. Recently I found that the same instrument can also be used for the measurement of the biischial, posterior sagittal, anterior sagittal, and sacropubic diameters.

The biischial diameter is measured in exactly the same manner as is done with Williams' pelvimeter. The rings of the instrument are brought against the ischial tuberosities with the tips of the thumbs placed within them. A reading is made on the scale while firm pressure is being exerted against the tubera. One and five-tenths centimeters are added to the reading for the thickness of the overlying skin and subcutaneous fat. Two hundred measurements taken in this manner gave an average of 10.71 cm.

For the measurement of the posterior sagittal diameter a slight modification of the pelvimeter is required. The convex border of the rectal blade is graduated in 1.0 cm. divisions, making the measurements diagonally from the distal border of the ring (Fig. 1). A crossbar with a notch in its center, of a length to fit exactly between the ischial tuberosities, is also required. An ordinary wooden tongue depressor, cut to the proper length, is very satisfactory for this purpose (Fig. 2).

For the actual measurement the tip of the left index finger is passed into the ring, and the blade resting on the dorsum of the finger is introduced into the rectum. The sacrococcygeal joint is identified by a combined internal and external manipulation, and the ring is placed and held gently against the joint with the tip of the finger. The crossbar is accurately adjusted between the ischial tuberosities with the thumb and index finger of the other hand. The blade of the pelvimeter is then raised against the notch of the crossbar and a reading is made on the scale.

The posterior sagittal diameter was measured by the above method in 147 consecutive cases. The average obtained was 8.62 cm. For comparison the diameter was also taken in the same cases externally with a Breisky pelvimeter. This measurement was made from the sacrococcygeal joint externally to the midpoint on a crossbar held by an assistant between the ischial tuberosities; 1.0 cm. was deducted for the thickness of the sacrum. The average for this series of measurements was 8.58

cm. The averages obtained by the two methods were thus practically identical. Considerable individual differences were, however, frequently encountered. These differences amounted to as much as 1.5 cm. or more in 26 instances. The discrepancies usually occurred in the cases in which it was difficult to find the sacrococcygeal joint.

The anterior sagittal diameter is obtained by placing the ring of the rectal blade against the inferior border of the symphysis pubis; the ring being held between the thumb and index finger of the left hand. The crossbar is accurately adjusted between the ischial tuberosities, and the reading is made as in the measurement of the posterior sagittal diameter. The average of 160 consecutive measurements taken in this manner was 6.33 cm.

Direct internal measurements of the sacropubic diameter can be made with the vaginal blade attached to the rectal blade in a reversed position. A slight modifica-

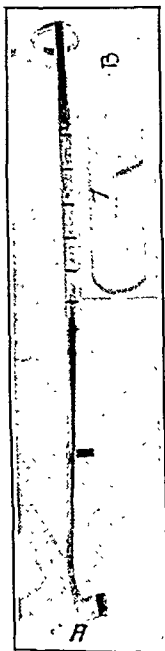


Fig. 1.

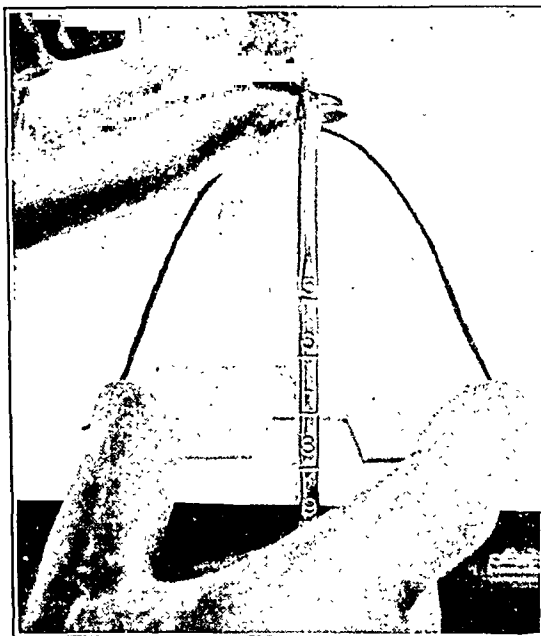


Fig. 2.

Fig. 1.—A, Lateral view of rectal blade, showing graduations. B, Crossbar.  
Fig. 2.—Measurement of the anterior sagittal diameter.

tion of the original instrument is required to obtain readings with the vaginal blade in the new position. This consists of a scale fixed to the rectal blade on the opposite side and symmetrical to the one provided for the measurement of the bispinous diameter (Fig. 3). This scale is graduated so as to represent the distance between the lower borders of the rings, with the vaginal blade reversed (Fig. 4).

To obtain the measurement, the rectal blade is introduced into the rectum and its ring steadied against the sacrococcygeal joint, as in the taking of the posterior sagittal diameter. The vaginal blade is adjusted as indicated (Fig. 4), and the lower border of its ring, held between the thumb and index finger of the other hand, is brought against the inferior border of the symphysis pubis. A reading is made on the scale while the rings are held in this position.

The sacropubic diameter was measured by this method in 160 consecutive cases. The average obtained was 10.94 cm. For comparison this diameter was also taken in the same cases externally with a Breisky pelvimeter. This measurement was



made from the sacrococcygeal joint externally to the inferior border of the symphysis pubis; 1.0 cm. was deducted for the thickness of the sacrum. The average for this series of determinations was 10.74 cm. As in the case of the posterior sagittal diameter, considerable individual differences were frequently encountered in the two series of measurements. These differences amounted to as much as 1.5 cm. or more in 21 instances.

The above comparative measurements demonstrate clearly the greater accuracy of the method proposed. It was found that the sacrococcygeal joint can be identified more readily, and with greater certainty bimanually, than by external palpation

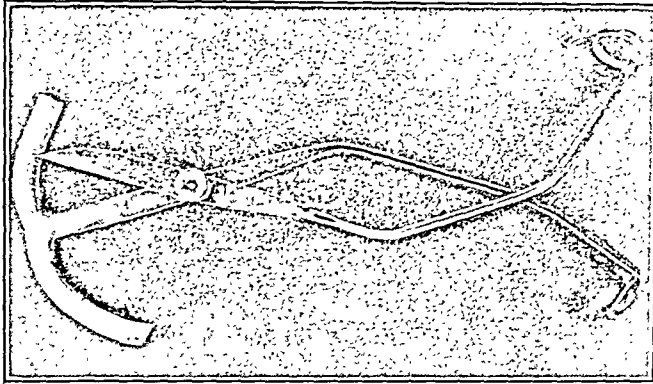


Fig. 3. The internal outlet pelvimeter in its present form, with a new scale on the rectal blade (*R*).

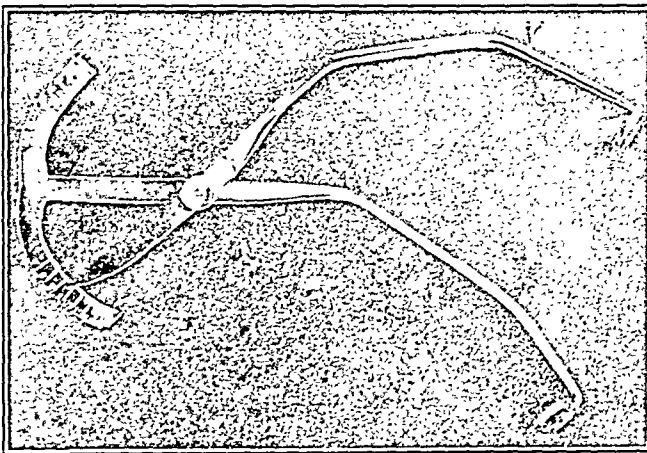


Fig. 4.—Vaginal blade (*V*) reversed for the measurement of the sacropubic diameter.

alone. It was also found that the tip of the sacrum is subject to considerable individual variation in thickness and form. Both of these sources of error are entirely eliminated by the method of direct internal measurement.

For the measurement of the bispinous diameter, the tip of the middle finger of the right hand is inserted into the ring of the vaginal blade (*V*). With the blade in place, the index and middle fingers are introduced into the vagina. The tip of the index finger of the left hand is similarly placed within the ring of the rectal blade (*R*), and is introduced into the rectum. The two blades are now locked, and the spinous processes are identified. The rings are then steadied against the spinous processes, and a reading is made on the scale. There were 1939 measurements taken

by this method. The average value obtained was 10.51 cm. This method was already described in greater detail in a previous communication.<sup>1</sup>

All of the above measurements can be made almost painlessly, and without the aid of an assistant. The use of one instrument for the measurement of all the diameters of the outlet, as well as the bispinous diameter, is another distinct practical advantage.

The instrument is made by George Tiemann & Co., 107 East 28th Street, New York.

1009 MEDICO-DENTAL BUILDING

<sup>1</sup>Hanson, Samuel: AM. J. OBST. & GYN. 19: 124, 1930.

## SELF-RETAINING VAGINAL SPECULUM

G. S. BEARDSLEY, M.D., EUGENE, ORE.

THE responsibility for cancer of the cervix rests almost entirely with the obstetrician. According to numerous authorities over 90 per cent of these cases are the result of neglected birth injury. Thomas E. Jones of Detroit states that, "Since in the final analysis, cancer of the cervix is largely an expression of incomplete maternity service, it becomes obvious that the solution of the problem rests almost wholly in the hands of the obstetrician."

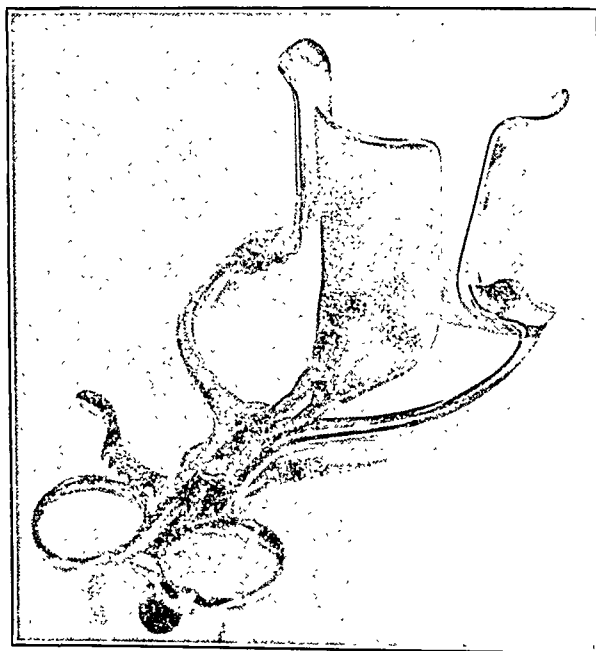


Fig. 1.

Only very rarely does carcinoma develop in the damaged cervix when promptly and properly repaired after childbirth. This means that the cervix should be routinely inspected immediately after delivery, and if laceration is found it should be sutured. However, in the small hospital we often lack the necessary assistants to hold the usual vaginal retractors. To overcome this difficulty I have

devised a three-bladed, self-retaining vaginal speculum which has been properly referred to as a "one-man instrument."

The instrument has several features peculiar to itself. The blades are solid, and relatively wide and short; and when in use completely retract the vaginal walls to afford an unobstructed view of the birth canal, and permit the cervix to be pulled down to the introitus without displacing the instrument. Also it will be noticed that the blades diverge slightly as they extend from the shank; and this feature together with the lipped ends makes the instrument absolutely self-retaining, even after episiotomy. The posterior blade is not weighted, and in repair of a rectocele or in any other situation where it is desirable the instrument may be inverted. The instrument is intended primarily for examination and repair of the cervix immediately postpartum, but could be used in a variety of plastic operations.

It is manufactured by Sharp and Smith, 65 E. Lake St., Chicago, and is called the Beardsley Speculum.

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### Erratum

In the article entitled "Anatomical Variations in the Female Pelvis and Their Effect in Labor With a Suggested Classification," by W. E. Caldwell, and H. C. Moley, published in the October issue, attention is called to the following omission:

The three illustrations of skeletal pelves, i.e., Figs. 8, 9, and 15, on pages 489, 491, and 496, respectively, were obtained from Professor T. Wingate Todd's collection of pelves of known sex at Western Reserve University and not from the U. S. National Museum. The authors are greatly indebted to Professor Todd and deeply regret this error in acknowledgment of the many courtesies extended. The Western Reserve material represents the largest collection of skeletons of known sex in existence and its scientific value cannot be too highly appreciated by the medical profession.

# Society Transactions

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## AMERICAN GYNECOLOGICAL SOCIETY

### FIFTY-EIGHTH ANNUAL MEETING

Washington, D. C.

MAY 8 to 10, 1933

The following papers were read and are published in this JOURNAL, except as noted:

1. **Nephritis and Pregnancy.** Dr. J. R. Goodall, Montreal, Canada. (See page 556, October issue.)

#### ABSTRACT OF DISCUSSION

DR. E. D. PLASS, IOWA CITY, IOWA.—If one looks upon chronic nephritis as a progressive disease, he must question the pregestational clinical diagnosis. This scepticism is not a reflection upon the clinician but rather a recognition of the inadequacy of our diagnostic methods. It seems incomprehensible that a progressive disease such as chronic nephritis may be improved or cured by pregnancy. If, however, our conception of chronic nephritis as a progressive disease is inaccurate, it is obvious that recoveries of this sort may occasionally occur. There are other pregnancy complications which apparently improve temporarily during gestation, such as diabetes, for example, during the latter months of pregnancy, with no glycosuria and blood sugar at normal levels. But one is certainly not justified in those instances in speaking of cured diabetes, because we know that, during the puerperium, or after lactation, the signs of diabetes reappear.

\* \* \* \* \*

DR. EDWARD A. SCHUMANN, PHILADELPHIA, PA.—I confess to a considerable degree of confusion after reading Dr. Goodall's paper. My first reaction, I must confess, was one of rather sharp disagreement. However, one may not lightly brush away the considered opinions of a man of Dr. Goodall's accuracy of observation.

I received the impression that he was dealing with two dissociated conditions. If it be true that the conception of Bright and his followers since 1829 is correct with regard to the destructive processes of glomerular nephritis, and the more modern opinions of the degenerative conditions in tubular nephroses which he described, I feel that it is very difficult to trace a connection between the repair or restoration of these pathological destructive processes and the endocrine glands. I cannot as yet reconcile these two conditions.

On the other hand, I have long agreed that the late toxemia of pregnancy, per se, is probably of endocrine origin. The discovery of pituitary extract in the urine of pregnant women, the well-known pressor activity of pituitary extract, makes one believe that somehow as a result of the stimulation of the pregnancy in decidual formation there will be some secondary effect upon the endocrine glands which in certain unbalanced individuals produces toxemia. I have long been opposed to the attempts to discover the etiology of eclampsia and the toxemia of late pregnancy by considering the débris left after the storm.

I would say in conclusion that I still cannot reconcile the restoration of destroyed tissue by the stimulus of the endocrines produced by pregnancy.

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\*For lack of space, it is not feasible to publish these discussions in full; they may be found complete in the current volume of the Transactions of the Society.

DR. FRED L. ADAIR, CHICAGO, ILL.—So far as my own recognition of similar cases is concerned I will say that it is extremely rare, probably due to the fact that we have in certain cases failed to recognize such a condition. Perhaps we have aborted some of these cases and unjustifiably attributed their improvement to the abortion. However, it would seem to me that possibly his case fits in more closely with what we consider to be a nephrosis rather than a progressive and chronic nephritis. Of course, the preferred treatment for nephrosis now seems to be a high protein diet. We are not going to be very clear about some of these conditions until we are in a better position to recognize the diversity of things which are included among the toxemias of pregnancy and in order to emphasize the diversity of these conditions I would like to present briefly the history of two cases which came to autopsy.

\* \* \* \* \*

DR. WILLIAM R. NICHOLSON, PHILADELPHIA, PA.—Twenty-five years ago a patient came to me to determine whether it was possible for her to become pregnant. As she had a blood pressure of 170 and a large amount of albumin, hyaline and granular casts, I strongly advised against it. Two years later she came back, was pregnant about two months, and insisted upon going on. Today she would have been evacuated at once because of her symptoms and it would have been recorded as a life saved. She had her baby by induced labor, three weeks before term. That baby is now a grown woman of 25. She has had the pleasure of her child for 25 years and until very recently she has had absolutely no symptoms and no difficulty except that she was under par and could not do many things that the ordinary woman does. She has continued to have albumin almost constantly, although it occasionally disappears. The blood pressure has remained consistently high. About a year ago she had a thrombosis from which she has entirely recovered.

DR. GOODALL (closing).—I do not believe these cases are cured permanently but they are tremendously improved. Permanency will depend upon the stability of the gland afterward. I have very little doubt that after many years some of them will develop nephritis. But what I want to emphasize particularly is this: that our clinical methods for the diagnosis of nephritis are thoroughly inadequate. I asked the internist, who worked the case out, whether he could diagnose an advanced functional disturbance of the kidney from one where there has been definite organic disease. He replied that he could not except in a small percentage of cases where there is a light dysfunction on the one side and a very advanced functional disease on the other.

The next question I asked was, How long can a dysfunction, such as the endocrine condition here producing a renal lesion, persist before organic disease appears? The internist said that it depends entirely upon the intensity of the condition and the instability of the renal system.

Dr. Schumann said that he could not attribute this condition to the endocrine dysfunction. Neither can I. I tried to emphasize that the organic trouble that exists in these cases is not due to endocrine disturbance, but to the metabolic changes. This change throughout the system we recognize in the advanced cases as the after-effects of advanced organic disease.

I want to emphasize that the pressor substance acts in the blood of one fetus independently of the water retention substance, just as in thyroid we may have exophthalmos in one case and in another case very marked cardiac trouble. Also in pituitary cases we may have only the pressor substance present and no edema,

and in other cases there may be the water retention substance with edema, extravasation into the lymph and tissue channels, and like changes.

As to the rarity of these cases I am not prepared to answer. The fact that I have been able to study five cases in the period of several years shows that the condition must be relatively common. There are cases which should be submitted to a careful blood chemistry examination before it is decided whether the woman is capable of bearing a child.

2. **An Analysis of a Series of Nonconvulsive Cases of Toxemias of Pregnancy.** Dr. Fred L. Adair, Chicago, Ill. (See page 530, October issue.)

**Comparative Studies of the Blood in the Nonconvulsive Toxemias of Pregnancy.** Dr. William J. Dieckman, Chicago, Ill. (by invitation). (See page 543, October issue.)

#### DISCUSSION

DR. H. J. STANDER, NEW YORK CITY.—I would like to stress the importance of repeated tests in blood chemistry. A single kidney function test is of no value. We see so many papers written and chemical studies done purely on a single determination. It is repeatedly seen that if several tests are made it will be possible to establish a level which is far below normal.

I cannot quite agree with some of Dr. Dieckmann's findings. He has shown that the nonprotein nitrogen is elevated in his eclamptic patients. This is elevated but only late in eclampsia. I think that is one of the differentiating points, to show that eclampsia has virtually nothing to do with nephritis. The first day or two it will be found that the level is usually normal. In the third or fourth day it may go to 30 or 60, or even as high as 70 mg. per hundred c.c., of blood and it will subsequently return to normal. I think that is due to the effect that the eclampsia may have on the kidney. In the earlier cases reported it was usually given as quite high.

In the  $\text{CO}_2$  combining power there is a drop in cases of eclampsia, the normal value in pregnancy being about 45 volumes per cent.

In the differentiation of cases into preeclampsia and nephritis, I agree with Dr. Dieckmann but I would like to go one step further in his nephritic group. There is one group which certainly is not nephritic, cases which may show a slight hypertension and a slight albuminuria that will go through the pregnancy normally and then come back with a second or third pregnancy without nephritis or toxemia. We have called that group low reserve kidney. Kellogg calls it recurrent toxemia of pregnancy. I feel quite strongly that it is not nephritic and it certainly is not preeclamptic.

DR. JOHN M. BERGLAND, BALTIMORE, MARYLAND (by invitation).—It seems to me that experience with the usual chemical and laboratory tests gives us very little important information as to the toxemias of pregnancy. On the other hand, I believe that a careful study of the patients before pregnancy with regard to a possible history of infectious diseases during pregnancy and in the months thereafter, often gives us a clear picture of the true condition. After all, I feel that the whole clinical outlook of the patient depends on the amount of kidney damage which has been sustained, and this cannot be determined often until a number of months have elapsed or even until the patient has a subsequent pregnancy. Sometimes we have been correct in our diagnosis, at other times, not. It is perfectly true, as Dr. Goodall says, that occasionally a patient may go through pregnancy, have a safe if premature delivery, and a good baby in spite of the fact that the situation looked very dark at the onset. I do not think, however, that such a case proves that there is a permanent improvement in the chronic nephritis. The kidneys

certainly are not improved. However, I do agree that a patient should be given the opportunity to have a pregnancy and continue in it if she is well acquainted with the possible risk that she runs in so doing.

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DR. J. HOFBAUER, BALTIMORE, MARYLAND.—Harvey Cushing has demonstrated the massive invasion of the neurohypophysis by basophilic cells in eclamptics, which was interpreted by him as new evidence in support of the work done at Hopkins which culminated in the demonstration that both the clinical symptoms and the biochemical-anatomic features of eclampsia can be validly explained in terms of posterior hyperpituitarism.

Dieckmann's studies likewise support our conception. Pituitary extract, in experimental animals, produces an increase of the specific gravity and coagulability of the blood, an increase of the red blood count and hemoglobin. Under the stimulus of pituitary extract, the spleen vigorously contracts and forces showers of red blood cells from its large blood sinuses into the blood stream. In man, under such conditions, an increase up to 24 per cent was recorded.

Furthermore, Barbour quite recently reported loss of plasma of the blood following the administration of pituitrin.

Our work stresses the importance of the liver as an important agent, along with the capillaries, in destroying pituitary hormones. A diminution of the protective function of these structures during the second half of pregnancy, as demonstrated by several investigators, might readily result in a rapidly increasing concentration of pituitary and thyroid principles in the blood. This may be conducive to the development of toxic effects upon vital organs and metabolic processes, with arteriolar spasms, derangement of water economy and of inner oxydation (anoxemia) as its main features. Ultraviolet rays and alkali destroy postpituitary hormones. These agents may be used to advantage in eclamptics and preeclamptics.

DR. ADAIR (closing).—From a clinical as well as from a laboratory point of view we should recognize two general groups in this rather confused state of affairs regarding toxemia. *First, the group* very definitely associated with pregnancy, namely the preeclampsia and eclampsia which, I believe, differ in degree rather than in character. *The second group*, cases definitely aggravated by pregnancy but do not seem to be caused by pregnancy. One such affection seems to be where the pathology is of the vascular type, characterized by essential hypertension, which ultimately leads to kidney damage of the vascular tree with arteriolar sclerosis of the kidney. Another type is where the condition seems to be primarily renal and is typified by a number of different conditions which it is not necessary to detail at this time.

In order to check the accuracy of our clinical diagnosis Dr. Dieckmann and I went through these records independently, attempting to place clinical diagnoses. We only took the cases where we thought there was sufficient chemical data to make the diagnosis from a laboratory point of view.

In this group of nonconvulsive cases on which laboratory work was done, I selected 39 with a diagnosis of hypertension. Dr. Dieckmann had sufficient laboratory data on 22 of these to make a diagnosis from his point of view. He agreed with the clinical diagnosis in 21 of the 22. The laboratory diagnosis checked in 20 of these cases.

I selected a group of 55 where a diagnosis of preeclampsia seemed justified from a clinical point of view. Twenty-one of these cases had sufficient laboratory work for a diagnosis from a chemical point of view. The results in this series were not very satisfactory, as the laboratory diagnosis coincided with the clinical diagnosis in only 10 of the 21.

It is obvious that we have no clearly cut method, either clinical or laboratory, of differentiating the different types of conditions included under the generic name of "toxemias of pregnancy."

DR. DIECKMANN (closing).—Dr. Stander stated that the figures given for the nonprotein nitrogen in eclampsia were too high and that there is no kidney damage early in the disease. I agree with this statement and wish to point out that the increase in nonprotein nitrogen early in the disease is due to the oliguria or suppression of urine, and the nonprotein nitrogen will vary directly with the period of oliguria.

As to the low reserve kidney, I believe these patients all belong to the group of nephritic toxemia and differ only in degree. The fact that in successive pregnancies none of the symptoms or signs increase in severity is due to the prenatal care given. Proper diet, meaning a low acid residue, sufficient protein to maintain a positive balance, proper bowel elimination, rest, etc., will certainly reduce the work on the part of the kidney and circulatory system as a whole, although the patient has the disease, which *apparently* does not increase in severity.

Dr. Schumann asked how we differentiate between the renal and vascular types of toxemia. That is just as difficult for us as for anyone. I place them in one group. If the patient is young and the renal function test, which must be repeated a number of times because there are marked variations in these tests, shows a normal kidney, and particularly if the Addis count shows no marked increase in cells, I consider the condition as an essential hypertension in pregnancy. However, I would like to point out that so far as we, as obstetricians, are concerned, it does not make any difference in the end-result whether you decrease the kidney function by destroying the glomerular membrane or by an arteriolar lesion of the efferent artery.

**3. The Treatment of Prolapsus Uteri, With Special Reference to the Results Obtained by the Manchester Operation.** Dr. William Fletcher Shaw, Manchester, England (by invitation). (See page 667.)

#### DISCUSSION

DR. GEORGE GRAY WARD, New York City.—Our results may vary from Dr. Shaw's because of the difference in our follow-up methods. As I understand it, the follow-up, carried out on this large series of cases, is very often by letters and statements from second parties, whenever the patient cannot be seen. The follow-up we have on our own cases in the Woman's Hospital, New York, is a personal follow-up. We think that it takes the conceit out of a good many of us when we see our results with our own eyes. Many times the patient will be symptom-free but the result is not always as ideal as one would like.

We agree as to the fundamental trouble in prolapse being due to the overstretching or elongation of the supports of the uterus. The base of the broad ligaments and the uterosacral ligaments are overstretched, and an obstetric injury to the fascial supports is a predisposing factor. I take it that some of the cases included in this very large series may have had cystoceles rather than extensive prolapse of the uterus.

The principle involved in this operation which Dr. Shaw advocates is essentially the same that we have all been following. I have seen this operation done in Manchester by Fothergill so that I am aware of the technic employed there. We simply hook the cardinal ligaments on either side of the cervix together in front of the cervix, thus reefing them, which elevates the uterus and pushes the cervix back. This method was brought out by Alexandrof in Germany in 1906. The Emmet-Baldwin operation accomplishes the same thing. Reynolds of Boston also advocated a procedure many years ago which is not dissimilar. In our service, in the child-bearing cases the procedure advocated by Dr. Shaw gives us a very satisfactory



result. But in the nonchildbearing woman we frequently do not adopt that method because at the Woman's Hospital, we find that there is quite a large percentage of these cases who have diseased uteri, or are complicated by myoma and an hypertrophied cervix, or adnexal disease. We have found that nearly 80 per cent of cases of that type occur in these elderly women and therefore we have felt that it is better to get rid of these diseased organs on that account. If the uterus is not diseased, the interposition operation is often adopted.

With the Manchester operation I cannot quite see how one can prevent enterocele where there is a big Douglas' pouch.

I think it is most important that we should not have one type of operation for all cases, but should individualize our cases and use the operation that is best suited to each.

DR. FRANK W. LYNCH, SAN FRANCISCO, CALIFORNIA.—It is very interesting indeed to review the history of the operation described by Shaw. Most of us have felt that this operation was introduced by the Germans; it was used by Schroeder, later by Alexandrof; it was popularized by Ries when he first came to this country. We have all been doing this same general type of operation with excellent results, with a small mortality, by a technic which I have been astonished to find was developed by Donald in Manchester nearly as many years ago as this Society is old.

DR. SHAW (closing).—I am not bringing this operation forward as of my own devising, nor as showing better results in my hands than in the hands of any one of my colleagues. I do want to show that this operation has been performed for a continuous period of forty-five years in one center by practically every member of the staff, and that we are getting results which show as nearly as possible a cure in all cases.

Unfortunately, my Chief, Dr. Donald, seldom bothers about writing. The result is that he was content to perform this operation so that his pupils and guests might watch him and carry the operations to various parts of the world. It was not until many years afterward that he wrote anything about it. Later Fothergill brought it into prominence. He learned the operation, of course, from Donald but he did a large amount of good by publishing it afterward. In 1888, he was actually using catgut brought from Germany for the purpose. He used it for the deep suturing of the muscle and taught us how to rely on this type of suturing as the most important part of the operation. When I became his house surgeon in 1904, it was an established, recognized operation which every member of the staff was performing. We have used it continuously since.

Dr. Ward quite rightly says that probably everybody in this country is using the same operation and getting equally good results. But what I cannot understand is why one should bother to use any other operation for particular groups of cases. We get just as good results in old women as in young and in nulliparous as in parous women. Then why bother to perfect the technic of any other operation? Our operation takes twenty to thirty minutes and there is an enormous difference in time when we are dealing with old patients.

4. Granulosa Cell Ovarian Tumors as a Cause of Precocious Puberty, With a Report of Three Cases. Dr. Emil Novak, Baltimore, Maryland. (See page 505, October issue.)

#### DISCUSSION

DR. HOWARD C. TAYLOR, JR., NEW YORK CITY (by invitation).—The demonstrations of tumor function promise to contribute greatly to the more accurate classification of ovarian tumors. Such a new aid to diagnosis is especially necessary

in the granulosa cell group, where the morphologic limits within which the term may be used are, I believe, somewhat ill defined. The difficulty of reaching a positive diagnosis upon purely morphologic grounds was impressed upon me during a review, which I undertook for this discussion, of 112 cases of malignant ovarian tumor in the files of the Roosevelt Hospital laboratory. Of these cases there was one which had already been reported as a granulosa cell tumor in 1929. There were four more in which the diagnosis was probable and no less than eleven in which with a proper bias, the diagnosis of granulosa cell tumor might have been made. Particularly in the case of advanced tumors made up of cells growing diffusely or in the so-called cylindromatous form, the possibility of confusion with other undifferentiated growths seems to me to be very real. In this type the presence or absence of signs of functional activity may be a decisive factor in diagnosis.

The histologic form in Dr. Novak's cases as well as the corroborating evidence afforded by the development of the secondary sex characteristics give them a special claim to consideration as proved examples of the granulosa cell tumor and they should serve as standards upon which the diagnosis of future cases may be based.

It must be remembered, however, that the striking effects of the granulosa cell tumor on the endometrium and in the secondary sex characteristics are not entirely specific and are found in association with other ovarian neoplasms. The development of precocious puberty has in the past usually been reported with ovarian sarcoma or embryonal carcinoma, but, if these cases could be reviewed, many might prove, as Dr. Novak has pointed out, to be granulosa cell tumors.

There seems, however, to be at least one other distinct group of ovarian tumors which is connected with premature puberty. These occur in different forms but are all apparently teratoid in origin. One such case has been reported by Dr. Frank in which derivatives of all three germ layers were present. To this group may belong also the primary chorioepithelioma of the ovary of which three samples in children have been reported in the last two years. Of these the case of Siegmund—an instance of precocious puberty in a girl of six, is the most remarkable. The urine from this patient contained over 30,000 units of anterior hypophyseal hormone per liter and fragments of the tumor tissue also showed the presence of considerable quantities of this hormone. In interesting contrast with the supposed behavior of the granulosa cell tumors was the absence of any large quantity of follicular hormone in the urine of Siegmund's patient. On account of these cases, I wonder if Dr. Novak is justified in yet assuming that the granulosa cell tumor is the usual ovarian growth causing precocious puberty.

\* \* \* \* \*

In conclusion I wish to raise the very practical question of the proper treatment of a case of precocious puberty in the absence of a demonstrable tumor. In the case reported by Siegmund, to which I referred, signs of mammary development were present several months before any tumor was discovered and this delay in operation may have contributed to the child's death from metastases. A child of two years and two months with definite breast enlargement is now under my observation in the Memorial Hospital Breast Clinic. No tumor in the pelvis is palpable but examination of the urine has shown the presence of 500 units of prolactin per liter and a trace of female sex hormone amounting to possibly 10 units per liter. The present plan is to examine the patient monthly in the hope of detecting as early as possible, any developing tumor. The case illustrates a rare but very real problem.

DR. OTTO H. SCHWARZ, St. Louis, Mo.—I wish to call attention to a case of precocious menstruation that has been observed recently by Drs. C. D. O'Keefe and R. J. Crossen in St. Louis. The patient, who is now twelve years of age, began menstruating at four and one-half years. She was irregular until nine years of

age, and for the past three years has been fairly regular and the flow quite profuse sometimes extending over a period of ten to twelve days.

The patient has been thoroughly studied, and no definite cause as to this abnormal function has been found. The adrenals, pituitary and ovaries have been practically ruled out. From the x-ray, there is marked intracranial pressure present, as shown by the definite convolution atrophy of the bones of the skull. There is premature closing of all epiphyses. The blood chemistry was entirely negative, except for a high blood calcium. It is suggested that we are dealing with a pineal tumor with a resulting hypopinealism.

DR. NOVAK (closing).—I agree with Dr. Taylor that one cannot too casually assume the granulosa cell nature of ovarian tumors which may be present in cases of precocious puberty. I have stressed this point in my paper, citing a case of my own, as well as others from the literature, in which no ovarian tumor of any kind was present. Nevertheless, when an ovarian tumor coexists with this syndrome, it is most likely to be of the granulosa cell variety. There is no doubt that many cases described in the older literature as sarcomata really belong to this family of tumors.

The second case which Dr. Taylor described, one of precocious puberty, and which he feels is so doubtful, I would unhesitatingly diagnose as a typical granulosa cell tumor of the sarcoma-like variety. Many histological patterns are encountered in these tumors, and numerous blocks and sections should be taken. Through the kindness of Dr. Samuel Wolfe, of Brooklyn, I recently examined a slide which in most places was a typical round cell sarcoma, but which in one segment presented a very frank granulosa cell picture. The folliculomatous type is the least common, while the cylindromatous is very frequent and very distinctive.

Dr. Schwarz's case, like my own Case 4, belongs to the group in which no tumor has been discoverable, and it is quite possible that in neither of them will a neoplasm ever crystallize out. In these patients, the forces of puberty are, for some unknown reason, released abnormally early, so that the patient merely skips her childhood. In my own patient the histological examination of the ovary showed that ovulation had been taking place, so that impregnation was theoretically possible if insemination had occurred. The remarkable cases of precocious pregnancy reported in the literature must likewise have been associated with ovulation, so that they can scarcely be explained on the basis of granulosa cell tumors. My incentive in this paper has been to call attention to these biologically interesting tumors, and to their characteristic association, when they occur in children, with the syndrome of precocious puberty.

5. **Prevention of Cancer of Cervix Uteri.** Dr. Harry S. Crossen, St. Louis, Mo. (See page 686.)

6. **Radiation Therapy in Carcinoma of the Corpus Uteri.** Dr. William P. Healy, New York City. (To appear in a subsequent issue.)

7. **Coincident Surgical Exposure and Radium Therapy in the Treatment of Extensive Cervical Cancer.** Dr. Arthur H. Curtis, Chicago, Ill. (See page 569, October issue.)

8. **Advanced Carcinoma of the Cervix, With a Report of 166 Necropsies.** Dr. Charles A. Behney, Philadelphia, Pa. (by invitation). (See page 608, October issue.)

## DISCUSSION

DR. FRANK A. PEMBERTON, Boston, Mass.—I agree that the crux of the situation is early diagnosis and that can be attained only by the regular examina-

tion of women, especially those who have borne children. I believe one is wise to concentrate on the ages from thirty-five to fifty-five. A year is the best period of time to choose between examinations. Cancer of the cervix probably runs its course if not treated in about two years in the majority of cases so that examination every six months would be better but patients balk at such frequent visits. It is my experience that they are glad to come regularly if the reason is explained to them and that they are not alarmed by the explanation. I find that they like to be sent for by the physician at regular times so that they may dismiss the subject from their minds during the interval.

The next important point is the cure of chronic cervicitis. There are several methods to adapt to the various types of patient. We have found that among 1087 patients who had repair of the cervix at the Free Hospital for Women between 1880 and 1920, 23 cases of cancer of the cervix appeared in from five to thirty-six years after the repair. That is 2.1 per cent developed cancer. Nineteen had no intervening pregnancy. It may be that more radical measures in treatment are advisable.

The third point is the very difficult problem of what constitutes the microscopic picture of early cancer of the cervix. Some definite criteria must be formulated for there is no agreement at present among pathologists. Repair processes are so common in the cervix and so easily confused with early carcinoma and vice versa that many cases of cancer probably are missed and many are diagnosed as cancer which should not be. It is our opinion that a pathologist must have an extensive experience in the examination of sections of cervical tissue in order to be able to differentiate the two conditions.

DR. CHARLES C. NORRIS, PHILADELPHIA, PA.—I believe that Dr. Crossen has rather underestimated the ultimate mortality from carcinoma of the cervix. Statistics from the best clinics show a five-year mortality of from 70 to 75 per cent. From the country at large the mortality is undoubtedly larger, probably in the neighborhood of 85 or even 90 per cent.

Carcinoma of the cervix is usually a painless and insidious disease until moderately advanced. About 80 to 85 per cent of cases of cervical carcinoma occur in multipara. The chronic inflammatory lesions which develop in almost all badly lacerated cervixes are generally concluded to be a predisposing factor to the development of this tumor. Eradication of the cervicitis prior to the cancer age would seem to be an efficient method of preventing the development of this disease. Numerous studies have been undertaken with a view to determining the efficiency of this treatment. The combined statistics of Pemberton, Graves, Smith and Bland, as quoted by Saltzstein and Topcik, show that among 18,562 patients adequately treated for the predisposing lesion, 15 subsequently developed cancers, or in other words only one in every 1,247 patients so treated for chronic cervical lesions later developed carcinoma of this region. Studied in another way the same investigators found that among 2,250 cases of carcinoma of the cervix, only 33 or approximately 1.5 per cent had received adequate prophylactic treatment. It is, therefore, apparent if it were possible to eradicate the cervicitis which is often present in multipara the chances of carcinoma developing would be greatly diminished and the frequency of the disease markedly decreased.

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DR. FRANK W. LYNCH, SAN FRANCISCO, CALIFORNIA.—The etiology of the exciting cause of cancer is a preexisting inflammation. Sometimes we lose sight of the fact that even virgins may have preexisting inflammation and in a study of the frequency of cancer in multiparous women I have found by looking over the work

of Gray and West a total of 1,500 cases with an average of 15 per cent of cancers in nulliparous women. According to the United States Census, 30 per cent of women in the cancer age were unmarried and 7.5 per cent of women in the same census had been married for more than a decade and had not been pregnant. And so, roughly speaking, this 15 per cent of unmarried or nulliparous women in this country represents 15 per cent of the cancer incidence, whereas the multiparous women represent 85 per cent.

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DR. CURTIS F. BURNAM, BALTIMORE, MARYLAND.—I am thoroughly in sympathy with the aims and with the plans of Dr. Crossen. My belief, however, is that by such methods there can be only a moderate gain in cure rates and only a moderate increase in the discovery of early cases. It must be remembered that pre-cancerous lesions are difficult to recognize and that the methods we employ in treating erosions, tears, leucoplakias, etc., are as yet untested so far as their value in affording immunity from cancer is concerned.

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DR. EDWARD H. RICHARDSON, BALTIMORE, MARYLAND.—It was my intention to contribute a brief report on similar autopsy material to Dr. Behney's from the Johns Hopkins Clinic. I progressed far enough to see that the findings in all essential respects do not differ materially either from those just reported by Dr. Behney or from those recently published by Warren from several Boston hospitals.

The clinical features of Dr. Behney's report—including age incidence, initial symptoms, tragedy of therapeutic delay, complications, duration of life and causes of death—confirm the experiences of clinics everywhere.

Attention should be focused particularly, however, upon several significant points brought out with regard to radiation therapy. First, its value as a palliative measure in advanced cases both in prolongation of life and in diminution of suffering. But I was surprised to learn that in the decades from 50 to 70 radiation appears to hasten the end. Second, the comforting observation that radiation properly applied does not increase the incidence of ureteral obstruction. Third, metastases beyond the pelvis occurred in 41 per cent of the untreated patients but in only 23 per cent of those radiated. Fourth, autopsy determination of the location and prevailing sequence of metastases should prove to be of distinct value to the roentgenologist in guiding his therapeutic efforts outside the pelvis.

I am a bit perplexed over the fact that while these statistics clearly confirm the prevailing view that the more anaplastic tumors exhibit a greater tendency to metastasize and are also relatively more radiosensitive, they are at variance with the generally accepted belief in that they failed to disclose a definite relationship between prevailing type of tumor cell and duration of life.

DR. GEORGE GRAY WARD, NEW YORK CITY.—Our results at the Woman's Hospital in carcinoma of the fundus are as follows: From 1918 to 1927, inclusive, we have had a five-year observation on 57 cases of adenocarcinoma of the fundus uteri. One case was lost in the follow-up; four cases were discharged without treatment because they were too advanced; and there were 29 cases living five years. There was an absolute cure rate of all cases of 50.8 per cent; a relative cure rate of 54.7 per cent. Cases treated with radium alone, due to the fact that they were poor surgical risks, having cardiovascular disease, diabetes, etc., amounted to 36. Of these 17 lived five years or over, a percentage of 47.2. Cases treated with radium and surgery, that is following the initial diagnostic curettage and application of radium at that sitting, some weeks later removing the uterus by panhyster-

ectomy, totaled 15. Ten of these were living five years, or 66.6 per cent. Of the early cases treated with operation alone, not receiving radium, there were two and they both lived five years, a percentage of 100.

We had 14 women, who had died of carcinoma, upon whom we performed autopsies, with the following findings: urinary system involved in five cases; distant metastases in six; intestinal obstruction in three; and diffuse peritonitis in six cases.

The causes of death were shock from an operation for intestinal obstruction in one case; peritonitis in six cases; pneumonia in two; carcinoma in three; cerebral hemorrhage in one; intestinal obstruction in one; and uremia in one.

DR. FRED L. ADAIR, CHICAGO, ILL.—It has seemed to me that in some of these cases we are dealing not solely with cancer, but with the cancer individual; in other words, with people who have a predisposition toward the development of cancer. I think one reason why that is not obvious is that in the vast majority of cases the person dies from the primary cancer. One sees occasionally cases in which cancer develops in different portions of the body, and not only in unrelated portions of the body, and significantly the cancer is of a different type.

It seems only fair in considering the prevention of cancer to consider the possibility of prevention by hereditary means. A certain amount of statistical data informs us that there is a hereditary predisposition to cancer. Another point is that there is very definite biological evidence that cancer is hereditary. Perhaps the reason we do not see more of these cases in the human being is that very likely the individuals who have the least resistance to cancer from an hereditary point of view are the ones that most frequently die from the primary cancer.

I realize fully the difficulty of hereditary problems. But frequently a doctor is consulted by individuals contemplating marriage and I think one would be willing to say that if they both had a cancer ancestry it might be well for them to reconsider their marital plans. On the other hand, of course, cancer usually develops late in life and these individuals have had an opportunity to lead quite a long and useful life before they die with cancer.

DR. CROSSEN (closing).—For some years I have followed with a great deal of interest Dr. Healy's work with cancer of the corpus uteri, and with a great deal of encouragement to myself. I have had to let patients go without operation, because they could not be operated upon, depending on radium instead. In these cases I depended on irradiation with a great deal of uncertainty and trepidation, but the results were encouraging. Then Dr. Healy came along with much more encouragement and now I do not feel nearly so bad when I have to tell a patient that we must use radium instead of operation. The results obtained in these cases with the combination of radium and x-ray have been so good that I now employ irradiation in all except the first-class operative risks.

DR. HEALY (closing).—I would like to emphasize the fact that 97 per cent of the cases of adenoma malignum were cured by hysterectomy, and only 50 per cent of the adenocarcinoma cases were cured by that operation. We did not have a single mortality in our hysterectomies, practically all of which were done six weeks after radiation. We had 73 hysterectomies in this group without a death and, of course, no mortality from radiation, 134 cases, whose age average was in the sixth decade of life without a death.

Dr. Ward's communication verified exactly that we have been having about 50 per cent of five-year cures in cancer of the corpus treated by hysterectomy and that made us believe that we were curing all of the cases. However, all of these do not live. You cannot get much more than 50 per cent of five-year cures in cancer of the corpus by hysterectomy alone and I want to emphasize again the importance

of bearing in mind that adenocarcinoma of the corpus is going out of the hysterectomy class into the radiation class; and, on the other hand, if you feel that it is such a favorable case for operation that you must do a hysterectomy, then the patient should be given the benefit of preoperative irradiation both within the uterus with radium and around the entire pelvic cavity with roentgen rays.

DR. BEHNEY (closing).—In view of Dr. Burnam's observation, that the greater frequency with which visceral metastases from carcinoma of the cervix have been seen in recent years may be due to the more general use of irradiation in the treatment of this disease, some of our incidental findings may be of interest. We determined the duration of life of each patient from the time of the appearance of the initial symptom. The patients in whom metastases beyond the pelvis had not occurred were those with the shortest average disease duration. The average life after the first symptom was twice as long in those who exhibited extrapelvic metastases as in the first group and the patients with metastases beyond the diaphragm lived with cancer two and one-half times as long as those who had no visceral metastases. In other words, metastases beyond the pelvis occurred more frequently after the cancer had been present for a considerable period of time.

With regard to Doctor Richardson's discussion, I should like to add that we had certain patients past 50 years of age, who lived a very long time after the onset of their disease. The majority, however, survived for so short a period that the average life for the group was much less than in the ones under 50. Furthermore, patients over 50 who were treated, lived on the average very little longer than those who had not been treated. These findings were attributed to poor tolerance of elderly patients to irradiation and to infections. We believe that for such patients irradiation should be especially planned and should be administered with extreme caution.

Several years ago we reviewed a series of over 450 patients whom we had followed up until they died. Our findings indicated that the application of radium to the primary growth in cases which have progressed to Stage IV may be actually harmful. While the average duration of life, after admission in this advanced stage, was twice as long in the patients who had received radium irradiation as in those who had not been treated, it was only one-third as long as when only high voltage x-ray treatment was employed. Since then we have been confining our therapy in Stage IV carcinoma of the cervix to high voltage x-rays. We believe that with such therapy we are securing as much or more palliation, and avoid the rapid breaking down of tissues and early death so often seen after intensive radium application in patients with advanced disease.

9. A Young Ovum of the Early Somite Period. Dr. Jennings C. Litzenberg, Minneapolis, Minn. (See page 519, October issue.)

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10. Further Studies of the Fascial Planes Surrounding the Vagina. Dr. Nathan P. Sears, Syracuse, N. Y. (by invitation). (See page 614, October issue.)

#### DISCUSSION

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DR. BYRON H. GOFF, NEW YORK CITY.—In 1930, before this society I presented photomicrographs of histologic cross-sections from the urethrovaginal, the vesicovaginal, and rectovaginal septa of a normal nullipara. In the sections from the urethrovaginal septum there was no connective tissue between the muscular

coat of the vagina and that of the urethra. The smooth muscle of the vaginal wall and the smooth muscle of the urethral wall fused with no line of natural cleavage between the two walls. The sections from the vesicovaginal and the rectovaginal septa correspond in every respect with those published by Blair Bell in 1910.

In the January, 1933, number of *THE AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY*, Koster, of Brooklyn, published his findings in a cross-section histologic study of the vesicovaginal and rectovaginal septa of a normal multipara. The findings in this study agree completely with those of Blair Bell.

In the cross-section histologic study of the vaginal walls and the surrounding connective tissue from a young nullipara which has just been presented, Dr. Sears has demonstrated in addition to the perivaginal areolar fascia two thin strands of connective tissue which partially surround the muscular coat of the vaginal walls. The strand of connective tissue which originates at the side of the vagina and passes in front of the anterior vaginal wall has been termed prevaginal fascia while the strand which also originates at the side of the vagina and passes behind the posterior vaginal wall has been termed retrovaginal fascia. In my opinion these two layers of connective tissue, which Dr. Sears does not consider as a part of the areolar perivaginal fascia, are in reality merely condensations of the areolar fascia which are commonly found in the neighborhood of blood vessels not only at the sides of the vagina but elsewhere in the thoracic, abdominal and pelvic cavities. I believe that the sections in Dr. Sears' study confirm the findings of Bell, Goff, and Koster. In a microscopic examination of Dr. Sears' slides I find no fascia other than the areolar perivaginal fascia which has been previously described.

I wish to stress one point: In the cavities of the body distensible organs are never surrounded by rigid layers of dense fascia. Such organs are always surrounded by areolar fascia. The vagina is surrounded by such areolar fascia only.

DR. SEARS (closing).—Although all gross dissections have agreed as to the general arrangement of the pelvic fascia, it is evident that its histologic structure can be determined only by microscopic study after special staining. I do not believe that we have reached the point where we can express a positive opinion as to what are the component structures of the layers dissected at operation and what exists as a support after operation. That would require the examination of many specimens removed at operation and at autopsy so far as possible many months after a successful repair. It is quite probable that such studies will reveal muscle and other structures beside fascia. I believe, however, that the fundamental tissue will be fascia.

Dr. Goff has said that he believes the band of tissue below the vaginal muscle to be a part of the muscle. If one traces medially the plane of fascia lateral to the vagina, it will be found that it is continuous with the layer below the vagina. This fact would tend to show that the layer beneath the vaginal muscle and the plane lateral to the vagina are composed of the same tissue. It is therefore anatomically impossible for this structure to be muscle, since vaginal muscle tissue could not penetrate the dense layer of blood vessels to appear so far lateral to the vagina. It is also true that microscopically this plane is shown taking the characteristic stain of fascia.

**11. A Survey of a Series of Myomectomies With a Follow-Up.** Dr. Hilliard E. Miller, and Dr. Curtis H. Tyrone, New Orleans, La. (by invitation). (See page 575, October issue.)

#### DISCUSSION

DR. RALEIGH R. HUGGINS, PITTSBURGH, PA.—In my opinion, it requires a higher degree of judgment and better operative skill to do myomectomies than hysterectomies. It has gradually become our habit to operate by this method, doing



myomectomies in young women who are anxious to become pregnant; that is, before the age of 35, and to cooperate to the best of our ability under all circumstances.

In a series of about 25,000 deliveries at the Elizabeth Steel Magee Hospital, during the last ten years, there have been two cases of perforation of the uterus, following myomectomy. One of these complicated a rather difficult delivery. It is necessary for the obstetrician, in a case with a history of previous myomectomy, to give careful consideration as to the method of delivery. Among 101 myomectomies we had two deaths. These were in very small subperitoneal tumors, not more than 2 c.c. in diameter and removed as a matter of routine in doing other operations. They should not be regarded as a factor in the mortality in this series.

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DR. COLLIN FOULKROD, PHILADELPHIA, PA.—From the viewpoint of the patient who desires children, we should pursue the conservative course in all young married women because, in the process of pregnancy the fibromyoma, while it is increased in size, does not offer any great menace. After the pregnancy is developed to term we must evaluate what we shall do. Most of us have done myomectomies on small fibroids, and we have left large fibroids in the uterus rather than endanger the woman's life with a major operation and ensuing blood loss. A patient who had had two or three abortions, in different cities, and who finally had a myomectomy performed with a number of fibroids removed, came to me pregnant. I found that one of the fibroids had been overlooked but as she desired to have a child she was allowed to go to term. The fibroid obstructed the delivery of the child and cesarean section was done. In the course of the recovery there was a certain amount of necrosis in the fibroid but she recovered.

The question will always arise as to how far one can go in removing these fibroids without endangering the walls of the uterus. We know that we can do several sections without endangering the uterus. Within the last week I have seen a patient on whom I had done two sections, taking out a portion of the wall of the uterus each time and neither of the previous scars had ruptured at the time the patient returned. We delivered her this week by a third section, of twins at term. One is never able to determine why these scars rupture. The extent of implantation of placenta over the previous scar has, in my opinion, more to do with the rupture of the scar than any other factor.

DR. WILLIAM R. NICHOLSON, PHILADELPHIA, PA.—It occurred to me that in these openings in the uterus, necessitated by multiple removal of tumors, the caution should always be given that the woman in the latter part of a subsequent pregnancy should be in a position where prompt relief can be given to her if these very deceiving symptoms of rupture arise.

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DR. MILLER (closing).—May I have the opportunity to speak of one or two practical points in connection with myomectomies? First, I believe the time for selection of the operation is most important; the operation should be undertaken preferably as soon after menstruation as possible. This will allow the uterine wound to heal firmly before the onset of the next menstruation. In three cases of this series I had some difficulty at the time of the operation; there was definite evidence of hemorrhage into the uterine wound, and in one instance it was necessary to open the abdomen at the lower end and drain the cavity.

I believe too much stress has been paid in the discussion of the possible rupture of the uterus in subsequent pregnancy. The same conditions do not exist as follow cesarean section, and I believe if a large series of myomectomies are reviewed from the standpoint of subsequent deliveries, very few cases of rupture will be found.

I agree with Dr. Nicholson in regard to the selection of cases. The list reported this morning were all from private work. In a large free service, with a high percentage of negro patients, we found few, if any, cases which could be treated by myomectomy. In fact, among the negro patients in the last four or five years, I have not found what I considered a suitable case for myomectomy. They rarely apply for treatment until the growths are large, and at least one-half of them merely come because of an associated salpingitis or pelvic peritonitis.

In this series reported upon, the myomectomies done during pregnancy were in each instance due to symptoms which would have eventually meant abortion. The results were uniformly happy. If the uterus is handled with care, large growths may be enucleated without disturbing the pregnancy. Ordinarily I should say that it might be a better practice to carry the pregnancy to full term, and do a cesarean section at that time, but in the reported cases conditions had arisen which would have meant an inevitable abortion unless we had interfered.

I think it requires a great deal of experience and judgment to select cases for myomectomy. Large growths may be associated with a small uterus, which presents healthy musculature; one or two small growths may be found in musculature which is definitely diseased, and make hysterectomy necessary. Another practical point which I have found of benefit is the preliminary ligation of the branches of the uterine artery at the side of the uterus before attempting enucleation. This reduces hemorrhage, and would, therefore, make use of much less catgut in closing the uterine incisions.

12. **Endometrial Hyperplasia and Its Relation to Endocrine Dysfunction.** Dr. James E. King, Buffalo, N. Y. (See page 582, October issue.)

#### DISCUSSION

DR. RICHARD W. TE LINDE, BALTIMORE, MARYLAND.—Our knowledge of the etiology may be divided roughly into three stages. First in 1900, Cullen described the condition and, at the suggestion of Dr. Welch, named it hyperplasia, thus taking it out of the inflammatory category. Second, there was the combined work of several men, Schröder, Meyer, Novak, Martzloff and Shaw, who in general agreed on the pathological finding in the ovaries. They demonstrated an absence of corpora lutea and a persistence of follicles. This suggested an absence of the corpus luteum hormone or an excess of persistence of the follicular hormone as being responsible for the hyperplastic endometrium. The third step in the advance of our knowledge concerning the etiology of this condition has to do with experiments carried out on laboratory animals and the results are somewhat confusing. Wolf, Cunningham and Burch believe they have produced changes in the glands of guinea pigs and rats, which they consider comparable to human endometrial hyperplasia. Assuming that an absence of corpus luteum secretion was responsible for the condition, commercial corpus luteum was used by many with the hope that the supplying of this deficiency would cure the condition. Results were disappointing. One very good reason for this was the absence of potency of these extracts. However, last year Clauberg changed the histological picture of the endometrium of a woman from that of hyperplasia to that of premenstrual hypertrophy by the injection of a potent corpus luteum extract. He checked his clinical results by examining curettings of the endometrium before and after the administration of the extract.

Following the production of an active extract of the anterior pituitary, which caused luteinization of the follicles in laboratory animals, Novak and Hurd attempted to treat bleeding women with hyperplastic endometrias by the injection of this hormone. In 44 of their series of 51 cases the bleeding ceased. My personal experience has not been as promising but one must admit that in certain cases in

which bleeding persists even after repeated curettage, it does stop after the administration of "Antuitrin-S."

Dr. King has mentioned Hofbauer's work, which is somewhat at variance with the views of the majority of workers in this field. Hofbauer concludes from his results obtained by the injection of acid and alkaline extracts and by the implantation of the anterior lobe "that hyperplasia may be reasonably regarded as a manifestation of overactivity of the anterior lobe." I have not been impressed with the evidence which he has brought forth in support of this theory. Some of the photomicrographs of guinea pig endometrium in his articles show no resemblance to human hyperplasia. Others do have dilated glands. I have found similar gland patterns in the endometria of untreated guinea pigs and they are not an infrequent occurrence.

So apparently the question of the relation of endometrial hyperplasia to the anterior pituitary gland is still unsettled. The present evidence, however, points more to the view that there is a deficiency of the luteinizing hormone rather than an excess.

DR. BROOKE M. ANSPACH, PHILADELPHIA, PA.—Hyperplasia of the endometrium is generally regarded as an exaggeration of the follicular phase in the preparation of the mucosa for the nidation of a fertilized ovum. The normal development of the mucosa from the postmenstrual phase throughout the interval up to the early premenstrual phase seems to be well understood and is evidently brought about and controlled primarily by the follicle ripening anterior pituitary sex hormone Prolan A, and secondarily by the follicular hormone itself. When in the course of the anabolic phase of the cycle the luteinizing hormone or Prolan B is denied, progesterin itself is not elaborated and the premenstrual changes in the mucosa fail to occur; the development of the mucosa that has already taken place may remain as it was without regression until it is acted upon again during the new cycle that follows, by the anterior pituitary sex hormone, Prolan A, and the follicular hormone from the newly developed follicle. This sequence of events may be repeated several times until the mucosa presents the structure characterized as hyperplasia. During this time there is no development of a corpus luteum, the follicles undergo atresia and ovular bleeding does not occur.

In a study of patients in our clinic at the Jefferson Hospital, in addition to the general and special clinical investigation and to the tests for the female sex hormone and the anterior pituitary hormones in the blood, we make a point of taking the endometrium for histologic study just before the time of an expected period. We do this because the histology of the endometrium seems to reflect the activity of the ovarian and the anterior pituitary sex hormones and may be taken therefore as an index of ovarian and anterior pituitary function. When there is a normal premenstrual mucosa there is usually a normal yellow body or a corpus hemorrhagicum in the ovary: this observation any one may make in the course of his operative work.

We may regard hyperplasia of the endometrium then as a hyperfolliculin and a hypolutein stage. The bleeding factor in hyperplasia is unknown. It is now more definitely evident that all uterine bleeding is not menstruation in the sense of the normal diapedesis of blood following ovulation and the formation of a corpus luteum and that uterine bleeding may occur without ovulation.

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DR. HOFBAUER, BALTIMORE, MARYLAND.—In order properly to understand the etiology of endometrial hyperplasia we must have at hand established facts. A consideration of the actual situation as regards knowledge of the causation of endometrial hyperplasia reveals that only two agents can be enumerated: sustained local hyperemia and anterior pituitary hyperactivity. The former is not primary in a strict sense, since it may be resolved into other factors (ovarian, nongratified

sexual desire, pelvic inflammation, et al.). In support of the latter may be mentioned experimental findings in guinea pigs and dogs with implantation of bits of anterior lobe, particularly with our new method of using exclusively the peripheral parts of ox pituitary which abounds in eosinophilic cells; the findings of anterior lobe hormone in the blood in about every ninth case of hyperplasia; positive Aschheim-Zondek tests in certain cases of hyperplasia; the actual demonstration of hyperplasia and hypertrophy of the anterior lobe in a fatal case of endometrial hyperplasia (Frankl); the occurrence of endometrial and muscular hyperplasia in cases of acromegaly (Teel).

The anterior pituitary registers its direct effect upon the basal layer of the uterine mucosa as judged by the response of this structure to pituitary administration in ovariectomized animals.

Hence, the anterior pituitary controls the regeneration of the uterine mucosa, after labor and abortion. Endometrial hyperplasia in the preclimacteric should be considered as a manifestation of anterior pituitary hyperactivity in the presence of, and associated with, insufficient or altered ovarian activity.

DR. EMIL NOVAK, BALTIMORE, MARYLAND.—While almost everyone feels that the anterior pituitary is behind the ovarian dysfunction characterizing hyperplasia, I agree with Dr. King and Dr. TeLinde that experimental investigations upon the mechanism involved have thus far been unsatisfactory. Dr. Hofbauer's work, as I understand it, was done with the growth hormone, which exerts a stimulating effect upon the growth of all tissues. For this reason, even aside from the objections pointed out by Dr. TeLinde, its pertinence seems open to question.

The most interesting phase of this problem is as to the hormone factors concerned in the bleeding. We have been in the habit of saying that the hemorrhage is the result of an excessive and prolonged secretion of folliculin, i.e., a hyper-folliculinism. As a matter of fact, so long as the endometrium is receiving a steady supply of folliculin, bleeding will not occur. The evidence now seems quite complete that functional uterine bleeding, as well as the bleeding of normal menstruation, is due to a withdrawal or sharp diminution in the folliculin effect. Such bleeding could probably, as a matter of fact, be held in abeyance, for a time at least, by giving sufficient folliculin to keep the endometrium propped up, as it were, though there would no doubt be a limit to such an artificial inhibition of the bleeding.

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DR. KING (closing).—I think from the physician's standpoint, and in fact from the whole standpoint from which I have tried to present this review, the subject is extremely complicated and sometimes by reviewing it we can more or less crystallize some of our own ideas. Certainly there is yet much to be done by the physician who, keeping these theories in mind, may do something to add proof or disproof to the theories.

13. **The Occipito-posterior Position.** Dr. G. C. Melhado, Montreal, Canada (by invitation). (See page 696.)

14. **Presidential Address: The Background of Our Natal Year.** Dr. Floyd E. Keene, Philadelphia, Pa. (See page 471, October issue.)

15. **Anatomical Variations in the Female Pelvis and Their Effect in Labor With a Suggested Classification.** Dr. William E. Caldwell, New York City and Dr. Howard Molloy, New York City (by invitation). (See page 479, October issue.)

#### DISCUSSION

DR. HERBERT THOMS, NEW HAVEN, CONN.—Last year I presented before this Society 20 cases of anthropoid and android pelves, each one of which was associated with primary or secondary occiput posterior. We have now seen 40 cases of that

kind in our relatively small clinic, so that we have come to consider the normal pelvis as possibly occurring in one of these three groups. The flat pelvis, it seems to me, may not belong in this group of natural variations. I think we may continue to call it the simple flat pelvis because we will continue to speak of pelves by their English names, that is, round and flat pelves. As Dr. Caldwell and Dr. Molloy have stated, the simple flat pelvis is very rare and perhaps is a rachitic manifestation when it does occur. The posterior position of the occiput must be treated in one manner if due to a flat pelvis, but if the pelvis is the anthropoid type it will have to be treated by a different method. It is therefore extremely important to know what the true pelvis is like before one attempts to deliver a posterior position.

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DR. CARL HENRY DAVIS, MILWAUKEE, WIS.—It seems apparent that in the management of the occipitoposterior, the type of pelvis must control the final decision.

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It is obvious that with certain types of pelves we would have no difficulty in reengaging the head and in delivering with forceps.

Dr. Caldwell brought out a very important point in that there are other factors besides the pelvis. I work in a community where there are a surprisingly large proportion of babies with round heads. Obviously a combination of the shape of the pelvis and the shape of the baby's head must be considered. We must be careful in making an attempt to forecast what will happen because we do not know the shape of the baby's head in advance except as we get x-ray pictures, and then we cannot forecast this accurately. There is no doubt that a careful x-ray of the pelvis is a very valuable adjunct to our other methods.

DR. COLLIN FOULKROD, PHILADELPHIA, PA.—I may have misunderstood the paper presented by Dr. Melhado regarding one or two points. It seemed to me that we should record ourselves as being opposed to the rejuvenation of the old operation of catching the fetal head and bringing it into the pelvis. The procedure takes the line of least resistance for a man who is unable to secure good results with version. He does a partial version in a case that should be solved by a normal forceps operation and then will grab the head and work it down into an adjustable position. There is always some risk for an occiput posterior and it is impossible to apply any one particular maneuver to solve all problems. I should feel very uncomfortable if the criterion that is given in the paper was thought of as a measure of producing an elective operation. Dr. Melhado suggested, I think, that the criterion was the cessation of rapid advance in labor. That is a little broad because I doubt whether any occiput posterior advances rapidly. In other words, after the situation is ideal for doing either a version or a forceps maneuver, to start and do an operation because of lack of rapid advance in an occiput posterior progress is to my mind making it an elective operation with almost all of his occiput posterior positions. It would seem to me that the dangers incident to applying the forceps in the hands of any excepting the very expert operator would lead us to avoid stressing that as an alternative method for version when the version operation is the method of choice in an occiput posterior case.

DR. OTTO H. SCHWARZ, ST. LOUIS, MO.—I notice that forceps with a pelvic curve were used. I would like to know why the Kielland or the Barton forceps were not used under these circumstances?

DR. MELHADO (closing).—By the term "rapid advance" I did not mean to imply that the head must be "coming down" extremely rapidly, but that the advance must be a definitely progressive one. Failing this, the longer interference is delayed the greater is going to be the fetal mortality and maternal morbidity. That has

been our experience. It was shown that when rotation of the head failed to occur the fetal mortality rose from 0.7 per cent to 5.5 per cent,—surely that is sufficient ground on which to adopt a policy of early interference.

I have had no great experience with the Kielland forceps. I have used the Barton forceps occasionally with satisfaction, but my preference is for a forceps with a good pelvic curve.

DR. CALDWELL (closing).—The failure of the presenting part to adjust itself to the most favorable diameter of the pelvis is the chief cause for dystocia and is found much more frequently than real bony disproportion. The occiput posterior positions with extension of the head or asynclitism, giving a larger diameter of the presenting part to descend through the birth canal, when not corrected prolong the labor, prevent retraction and dilatation of the cervix, give weak, tiresome, ineffective pains and lead to difficult operative procedure. Though the majority of women will ultimately correct and mold these malpositions, their early recognition and correction will greatly reduce the difficult labor and operative incidence. The bony architecture of the pelvis must be thoroughly studied to determine in which diameter the child's head will best fit. In many cases it is best to allow an occiput posterior to descend well down into the birth canal rather than to do an early rotation. We feel that it is a mistake to routinely do versions or rotate the head above the brim, and that when the bony architecture is thoroughly understood and flexion is maintained these major operations are seldom necessary.

I agree with Dr. Melhado that correction of malpositions should be done as early as possible and I congratulate him on his manual dexterity which has given him such good results; but I am inclined to think that in the hands of less skillful operators less dangerous procedures are equally effective and less risky.

16. Reaction of the Mature Human Ovary to Antuitrin-S. Dr. Samuel H. Geist, New York City. (See page 588, October issue.)

#### DISCUSSION

DR. ROBERT T. FRANK, NEW YORK CITY.—The human ovary is a very variable and varied organ, most difficult to study. Dr. Geist was certainly aware of this and consequently unable to formulate anything definite from the literature, that is, the descriptions of Zondek, etc. They lacked the detail so necessary from which to draw conclusions.

Of the changes mentioned, the least convincing are the hemorrhage and the engorgement, particularly as most of the ovaries were from fibroid bearers; but to find definite changes in 33 cases out of 40 receiving doses of anterior pituitary lobe hormone, and only in 4 cases out of 25 of noninjected ones shows that with such a percentage difference, some importance must be ascribed to the injections.

The importance of his work is that it gives us data on the human female. Those of us who work in the laboratory with animals have found such tremendous differences in different species. For instance, the resistance of the ovary of the rodent and of the monkey is so different that at first it proved extremely misleading to different investigators.

Although the apparent acceleration of follicle growth might be accidental, still the increase in luteinization seems to be definitely ascribable to the drug used. This is an advance as far as positive knowledge is concerned. What its clinical importance may be, I am quite unable to state, because if we simply theorize and say that by injecting follutein the luteinization of the cells follows, we are none of us as yet certain just what physiologic importance is ascribable to this change and it will require extremely careful clinical study to give us any definite information, because there is no test animal less reliable than the human female.

DR. KARL M. WILSON, ROCHESTER, NEW YORK.—I would like to emphasize that while the hormone found in the urine of pregnant women is in some respects similar in its activity to that of the anterior pituitary body, yet it is undoubtedly an entirely different hormone. It is important to keep this in mind both from the standpoint of the study of the function as well as from the standpoint of therapy.

Through the courtesy of Dr. Corner, I am permitted to show you the effect of the urinary hormone on the ovary of the immature Rhesus monkey. This animal received 1,200 rat units of antuitrin over a period of ten days, and shows in the ovaries marked fibrotic changes in the follicles with no particular development of lutein cells. I would like to see Dr. Geist repeat his experiment, carrying out the administration of antuitrin over a longer period of time, and perhaps he would then get a result more nearly comparable.

From the clinical standpoint, I am inclined to urge a word of caution in the use of these various hormones until we know a little more about what we are trying to do. If it is the effect of the anterior pituitary hormone which we wish to obtain in a patient, it would seem more logical to administer that particular hormone rather than the one obtained from the urine of pregnant women. In my clinic we have under observation at the present time a small series of women showing menstrual disturbances which we have definitely diagnosed as being due to deficient activity of the anterior pituitary body, and which have been relieved by the administration of anterior pituitary gland substance.

DR. GEIST (closing).—Dr. Frank's remarks about the gross appearance of the ovary associated with the ordinary fibroids are quite true. We made our observations before any operative procedure was undertaken so that the question of trauma was to a certain extent eliminated. It is true that the mere presence of a fibroid may cause gross changes in the ovary, but the percentage of injected cases that responded was so high that coincidence seems to be ruled out.

The picture that Dr. Wilson showed on the screen of the immature monkey is very similar to that shown by Dr. Engle at Columbia and whether we can reproduce that condition in the human by further injections I do not know. These patients had to be operated on, and were observed for three or four days previously.

At the present time we are all confused about results of these various anterior pituitary hormone-like drugs (which are purely empirical) in cases of bleeding. We know very little about bleeding at the present time and the effect that one obtains in the ovary would hardly make one believe that the injection of an anterior pituitary-like substance would control or regulate bleeding. Ordinarily we have felt that bleeding is associated with just the type of lesion in the ovary that results from Antuitrin-S injections. I think that we are progressing in our knowledge and it is well to continue our experimental efforts until we know something more about the actual physiology of menstruation and pathologic bleeding.

17. **An Evaluation of the Bissell Operation for Uterine Prolapse Based on a Follow-Up Study.** Dr. Byron H. Goff, New York City. (Published in *Surgery, Gynecology and Obstetrics*.)\*

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18. **Pelvic (Rectal) Palpation of the Female Monkey With Special Reference to the Ascertainment of Ovulation Time.** Dr. Carl G. Hartman, Baltimore, Md. (by invitation). (See page 600, October issue.)

## DISCUSSION

DR. EMIL NOVAK, BALTIMORE, MD.—There is an enormous value to gynecology in such studies as Dr. Hartman has been making.

\*The discussion of this paper appears in full in the current volume of *Transactions of the Society*.

However, it does not seem possible to avail ourselves of this method of bimanual palpation in determining the occurrence or nonoccurrence of ovulation in women. The mature follicle in the woman is not a very prominent structure, while atretic follicles may be very much larger, so that no conclusions can be drawn from palpation findings. It would be of the greatest value to have some simple method of determining the occurrence of ovulation in women, for I am firmly convinced that anovulatory menstruation is not as rare a phenomenon as we have been in the habit of believing, and that it explains at least some cases of sterility. There is a not inconsiderable group in which all other factors seem to be eliminable by such methods as examination of the husband, Rubin tests, metabolic examinations, etc., and in which sterility nevertheless persists. In this group will be found some who, while menstruating perfectly normally, are giving off no ova. The differentiation and the treatment of this group constitutes an important phase of the problem of sterility.

19. **End-Results in Treatment of Pelvic Infection.** Dr. Albert H. Aldridge, New York City (by invitation). (See page 705.)

#### DISCUSSION

DR. GEORGE W. KOSMAK, NEW YORK CITY.—Speaking in a reminiscent vein, memory goes back to a generation to the days when the radical treatment of pelvic infections was to the fore and the theatric display of pus tubes removed by laparotomy, was common. I doubt, however, whether a careful follow-up study was made of these cases such as Dr. Aldridge has outlined and, of course, it is upon these follow-up studies that future methods of treatment must depend. What probably saved a great many women in those early days was the lack of diagnosis and the more or less spontaneous cure of these cases; except where formation of a natural pelvic abscess brought about evacuation by a colpotomy. That applied also to the former treatment of ectopic gestations which, in many instances, were likewise not recognized; ruptures and hematoceles occurred. The latter became infected and were similarly evacuated, the patients finally recovering.

I believe that the success of the conservative methods depends largely on the introduction of protein therapy in recent years. Dr. Aldridge's cases I assume were almost entirely hospital cases. We get equally good results from the conservative methods of treatment in private practice and I think a great many of these cases, especially of the milder grades of tubal infection, can be very well treated without hospitalization and with equally good results.

There is one class of tubal infections which was not mentioned in which the question of operation must be most carefully considered, namely tuberculous salpingitis. I think we are very apt to trip up on our diagnosis, and we may continue treating such patients with conservative methods when it might be better to remove these infected tubes.

DR. HARVEY B. MATTHEWS, BROOKLYN, N. Y.—We have used pasteurized milk as a foreign protein and have obtained excellent results in a large group of cases. None of the manufactured "stock" activators are as activating as pasteurized milk.

We have used the Elliot treatment. Some of us feel that this is a much better form of treatment than the foreign protein method.

In determining when to operate we go through all of the laboratory and clinical gamuts to determine whether the case is chronic or not. We do not operate except when we feel sure that the case is chronic.

In looking over our records\* for the past three years to January, 1933, amounting to 305 cases, I found that we have operated on 62 per cent of our patients; 38 per

\*At the Long Island College Hospital.



cent therefore were not operated upon. These are pretty much the same percentages that Dr. Aldridge has shown. The radical operation was done in 52 per cent of our cases and the conservative operation in 48 per cent. The radical operation in salpingitis alone was done in 33 per cent; for fibroids, retroversion and salpingitis, in 66 per cent. This bears out the point that Dr. Aldridge made, viz.: that salpingitis with retroversion, or particularly with fibroids, is seen earlier and better managed because of this coexisting pathology.

DR. FREDERICK C. HOLDEN, NEW YORK CITY.—Last year we had 2,600 patients admitted to the Bellevue gynecologic ward service. As to the treatment we have a better opportunity than some of the private hospitals in that we keep patients there over an indefinite period of time.

In cases of salpingitis, with a short sedimentation time, acute bilateral pain, the patient may or may not have gonococci in the cervix in a large group of our cases. We have about 130 cases of this type. A very large percentage, and I say it unreservedly, left the hospital symptom-free and with a minimum of pelvic pathology. The points we stress are these: the patient has an ice-bag for the relief of pain and maybe an opiate as a sedative. We speak in terms of splinting the patient, not allowing her to move. She has a moderate elevation of the bed to allow drainage of the pelvis and has complete rest, not being allowed to sit up to eat. The bowels must move adequately each day, preferably by means of a mild laxative, and if there has been no movement by night an enema is given. She has a diet which does not distend the intestinal tract.

These patients are examined bimanually very infrequently. We feel that bimanual examination disturbs the inflammatory process. When the patient goes home she is given certain directions as to her living. She is told that it is impossible to undertake sex life; to stay in bed for the first two or three menstrual periods, to avoid long automobile rides, to observe the same bowel hygiene as prescribed in the hospital. It is surprising what good results one gets if you talk to these ward patients, simply telling them what nature has done for them and how essential it is to continue that mode of life. The husbands should be eliminated, otherwise the patients very soon become reinfected.

DR. ALDRIDGE (closing).—Mild cases were treated in the out-patient department with small intracutaneous injections of foreign protein, medicated tampons and vaginal douches when indicated. Many patients become symptom-free and completely healed under such treatment. We recognize the importance of rest, but experience proves that many patients with mild attacks of inflammation can continue with their routine duties while treatment is being given.

About one-half of the patients admitted to the hospital were treated with intramuscular doses of foreign protein. If symptoms recurred after they were discharged from the hospital, they were referred back to the out-patient department where the treatment was continued usually with small intracutaneous doses.

If the patient can be made to understand the danger and disadvantages of operation, it is usually not difficult to get her cooperation so that palliative treatment can be given a fair trial.

20. Breech Deliveries With Reference to X-ray Measurements of the Fetus and Maternal Pelvis. Dr. Thomas R. Goethals, Boston, Mass. (by invitation). (See page 715.)

#### DISCUSSION

DR. EDMUND B. PIPER, PHILADELPHIA, PA.—In 1926, I called attention to the depth, length, and height of the symphysis, as a factor in determining any accurate measurements of the true conjugate. That measurement ordinarily is practically

valueless. Pelvic measurements are a guide, a warning, but I do not think they should ever be used didactically. In the first place I should say from my experience that the delivery of the after-coming head in a breech presentation is much more delicate than in other positions because the head is not molded; it does not conform to the pelvis in any way, shape, or form. In the second place, my own experience would lead me to feel that I have more trouble with the arms than with the after-coming head. There was a case in our service at the Lying-In Hospital of a multipara, the seventh baby. I do not think any x-ray examination was made as she came in from the out-patient department. The membranes had been ruptured forty-eight hours when I saw her and the breech did not come into the pelvis, but she had had a great many babies and had a record of no great difficulty at delivery. In this case the feet were up around the face. Potter used to say, fold them over the head and perhaps they will go up backward. If you do that the shoulders will come down and it is then a question of the inclination of that pelvis as to whether they will catch. That is exactly what that case did, it got caught at the umbilicus. It was discovered afterward that the baby had a tremendously large head.

Another factor I would like to bring up is the question of the biparietal diameter. If a finger is placed in the baby's mouth and instead of trying to get the head in a diagonal position, rotate it to a transverse position, you will get the head past the symphysis pubis.

DR. GOETHALS (closing).—I am interested to learn of Dr. Piper's uncertainty as to the true conjugate in certain types of cases, because our difficulty has been to know whether our x-ray measurements of the true conjugate are more or less accurate than the reckoning of the conjugata vera from the measured diagonal conjugate. That is what we are trying to find out.

With regard to a situation where this method of x-ray mensuration may serve as a guidepost on our way, I have the record of such a case where I think it was very definitely a guide. (See history of the case of Mrs. F., as reported in detail in the body of the paper.)

I feel with regard to this problem of breech delivery that it is unquestionably true that undilated cervixes are the cause of more babies being lost, probably, than are pelvic contractions. In the case reported in the paper, for which I must take the full responsibility, I knew in advance that we had a fair chance of losing the baby before the operation was attempted, and I have nobody to thank for the outcome but myself.

21. A Study of the Effects of Theelin on Gonorrheal Vaginitis in Children. Dr. Robert M. Lewis, New Haven, Conn. (by invitation). (See page 593, October issue.)

## PACIFIC COAST SOCIETY OF OBSTETRICS AND GYNECOLOGY

MEETING OF DECEMBER 9, 1932

The following were among the papers presented which were found suitable for inclusion in the JOURNAL:

Granulosa Cell Tumors of the Ovary. Dr. Margaret Schulze. (See page 627.)

Nicotine in Breast Milk. Dr. W. B. Thompson. (See page 662.)

A Five-Year Study of Abortion. Dr. R. E. Watkins. (See page 161, August issue.)

The Problem of Irregular Menstruation. Dr. C. F. Fluhmann. (See page 642.)

Hemorrhage Following Cesarean Section. Dr. J. M. Slemons. (See page 656.)

An Analysis of 575 Cases of Eclamptic and Preeclamptic Toxemias Treated by Intravenous Injections of Magnesium Sulphate. Dr. E. M. Lazard. (See page 647.)

# Department of Reviews and Abstracts

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CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

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## Collective Review

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### THE INTERRELATIONSHIP OF THE ANTERIOR HYPOPHYSIS AND THE OVARIES

(THIRD REPORT. LITERATURE PUBLISHED BETWEEN JUNE, 1931,  
AND JUNE, 1933)\*

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THE past two years have witnessed a development in our knowledge of the physiology of the anterior hypophysis which leaves one aghast at the extent and complexity of the problem. Of primary importance, so far as gynecologists and obstetricians are concerned, are those phases of the work which deal with the gonad-stimulating factors of the anterior lobe, and this review is not an attempt to present a complete analysis of all papers published, but to summarize some of the recent discoveries in order to indicate the trend of modern research in this field.

#### OVER-STIMULATING HORMONES OF THE ANTERIOR HYPOPHYSIS

The operation of hypophysectomy in laboratory animals is now successfully performed in several laboratories, so that many new and important facts are constantly brought to light. Smith and White<sup>199</sup> have found that hypophysectomy in rabbits which ovulate results in the corpus luteum undergoing regression after a two-day period of growth. In pregnant does this is accompanied by a termination of gestation (White<sup>220</sup>; Firor<sup>49</sup>), and at certain stages of pregnancy there may be a temporary remarkable hyperplasia of trophoblasts (Firor<sup>49</sup>). If rabbits are hypophysectomized on the fifth or sixth day of gestation the corpora lutea lose within forty-eight hours their power to inhibit uterine contractions induced by estrin (Reynolds and Firor<sup>170</sup>). Blocking the pituitary circulation of pregnant rabbits produces results identical to those following hypophysectomy (White<sup>220</sup>). Smith<sup>197</sup> has studied the effects of incomplete removal of the anterior hypophysis in rats, and found that if 30 per cent or more of the organ remains, the gonads do not show any abnormal changes. Hill and Parkes<sup>80</sup> have reported that removing the hypophysis of a ferret more than one hour and fifty minutes after copulation does not inhibit ovulation, but the corpora lutea fail to develop normally. Pencharz and Long<sup>157</sup> have found that if hypophysectomy is performed in the pregnant rat, there is a prolongation of the period of gestation by three or four days and the mothers die without being able to give birth to their young. Swezy and

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\*See First Report: AM. J. OBST. & GYN. 18: 738, 1929. Second report: 22: 803, 1931.

Pencharz<sup>210, 211</sup> have made the important observation that after hypophysectomy there are many more ova and follicles in the ovaries of rats than under normal conditions, and there is abundant evidence of the formation of new germ-cells from germinal epithelium. Since they also find fewer ova and follicles in the ovaries of rats treated with pituitary implants, Swezy and Evans,<sup>209</sup> and Swezy<sup>208</sup> believe that the maturity factor of the anterior lobe depresses ovogenesis or the production of new germ-cells, although Butcher<sup>13</sup> suggests that germ-cell proliferation from the germinal epithelium is inhibited merely by the space relations and pressure of the numerous corpora lutea.

Many workers are still skeptical about the existence of two sex hormones of the anterior lobe, one responsible for follicle development (APH-A) and one for luteinization (APH-B). Although Van Dyke and Wallen-Lawrence<sup>214</sup> were unable to confirm the original work of Fevold, Hisaw and Leonard, Fevold and his collaborators<sup>47</sup> have published further impressive evidence that they have secured a partial separation of two such factors from sheep anterior lobe tissue. Smith and White<sup>199</sup> could not support the conception of dual hormones from the results of their hypophysectomy experiments in rabbits. Loeb<sup>131</sup> has considered the possibility of two hormones, one concerned with follicle growth and maturation processes of the granulosa and a second which acts in the opposite manner and leads to degeneration of the granulosa and thecal luteinization. Aron<sup>3</sup> thinks that gonadal hormones have nothing to do with any of these processes but are merely *motor* for the production of estrin.

An important recent development has been the recognition of species differences in the effects induced by the anterior hypophysis from various donors, and a number of valuable observations have been made by Loeb<sup>128, 129, 130</sup> and Loeb and Friedman<sup>133</sup> who have found two main types of anterior lobes according to their effect on the thyroid and sex organs of immature guinea pigs. Conversely, the test animal may also present differences, for example, with certain extracts it is difficult or impossible to produce more than thecal luteinization of the guinea pig ovary (Aron<sup>2</sup>, Guyenot, et al.,<sup>69</sup> King<sup>99</sup>). Lipschütz<sup>122</sup> believes that the anterior lobe of guinea pigs contains essentially only a follicle-stimulating factor, and Hellbaum<sup>74</sup> reports a similar characteristic of the pituitaries of horses. Hertz et al.<sup>75</sup> have drawn attention to a preparation of a growth hormone which has no gonadal effect in the rat but is capable of inducing luteinization in young rabbits. Hisaw and his co-workers<sup>86</sup> obtained a maximal ovarian response with an anterior lobe extract in monkeys and rabbits after eight to ten days of treatment, and following this a regression of ovarian changes occurred in spite of continued injections. Fluhmann<sup>56</sup> reported a similar finding in regard to the stimulation of increases in ovarian weight in rats with an acid sheep anterior pituitary extract. Lipschütz<sup>124</sup> and Lipschütz and Reyes<sup>127</sup> found that anterior lobe inoculations from immature rats are more potent than those from adults, while Ellison et al.<sup>36</sup> and Lipschütz and Reyes<sup>126</sup> found those of males more effective in inducing ovulation in rabbits than those of females. On the other hand, Wolfe and Cleveland<sup>231</sup> observed no sex differences in rabbits although the anterior lobes of very young females were deficient. Lipschütz<sup>123, 125</sup> was able with guinea pig implants to induce estrin effects in immature rats without producing apparent ovarian changes. Emery<sup>37</sup> has pointed out that after pituitary implants the ovaries and uteri of immature rats may continue to increase for a period of two weeks. Hogben and Charles<sup>57</sup> noted a prolonged fall in the calcium content of the blood serum of normal and spayed rabbits after the injection of a fresh saline suspension of ox pituitary material. Reynolds<sup>168</sup> found that anterior pituitary extracts have a direct effect on the motility of the uterus of the unanesthetized rabbit. The contention that anterior

pituitary material is effective by mouth (Lepine,<sup>121</sup> Janssen and Loeser,<sup>90</sup> Gutowska<sup>68</sup>) brings up an old question anew.

An interesting discussion of the concept of "precocious sexual maturity" was given by Engle,<sup>39</sup> who observed that in immature mice once treated with anterior lobe implants the first normal estrus occurred at a significantly later date than in normal controls. Riddle<sup>171</sup> found that the immature dove or pigeon is especially suited for testing the maturity factor of the hypophysis. Leonard<sup>114</sup> noted the inhibition of the sex factor of the anterior lobe by the growth hormone, and suggested the possibility of a separate factor for ovulation. Wislocki and Snyder<sup>228</sup> have successfully induced superfetation in the rabbit, while Shelesnyak<sup>169</sup> produced placentomata in young rats following inoculation of anterior lobe tissue.

Lack of space unfortunately prohibits extensive reference to recent studies on the thyrokinetic hormone of the anterior lobe, but some interesting observations regarding the interrelationship of this substance and the gonad-stimulating factor have been made (Loeb and Friedman;<sup>132</sup> Riddle, Bates and Dykshorn;<sup>172</sup> Green;<sup>66</sup> and others). Of importance and also beyond the scope of this review, is the recognition of the controlling influence of the pituitary gland over lactation and adrenal function.

#### HISTOLOGIC STUDIES OF THE ANTERIOR LOBE AND MODIFICATION OF THIS ORGAN BY OUTSIDE INFLUENCES

A considerable number of histologic studies of the anterior hypophysis have appeared during the past two years. Rasmussen<sup>160</sup> has given an interesting preliminary report of a study of the human adult female hypophysis. He made a differential count of the various cell-types, noted merely a slight increase in the percentage of chromophobes during pregnancy and stated that although the anterior lobe enlarges, "no special so-called pregnancy cell could be identified." The cell-types of the anterior lobes of several species of experimental animals have been studied by Wolfe and Cleveland<sup>233</sup> and cyclic variations in this organ have also been described (Wolfe and Cleveland;<sup>232, 234</sup> Wolfe, Cleveland and Campbell;<sup>236</sup> Reese<sup>161</sup>). Nelson,<sup>144</sup> in an extensive study, has given details of the development and cytologic differentiation of the anterior hypophysis of the fetal pig, and also found<sup>143</sup> that no characteristic changes occurred in the anterior lobe of female vitamin-E-deficient rats while the males presented castration effects. Guyer and Claus<sup>70</sup> reported that the anterior hypophyses of cancer-implanted rats resembled those of castrates. Wolfe and Cleveland<sup>235</sup> have described characteristic pregnancy changes in the anterior lobe of the rat, while Haterius<sup>72</sup> has discussed the time of the appearance and duration of "pregnancy cells" and believes<sup>73</sup> with Charipper and Taylor<sup>16</sup> that they are the effect of a stimulus originating in the corpus luteum. Brouha<sup>9</sup> and Desclin<sup>31</sup> found pregnancy changes in the anterior lobes of guinea pigs during pseudopregnancy, while Siegmund<sup>195</sup> believes that such modifications are brought about, not by a corpus luteum hormone, but by estrin. On the other hand, Stein<sup>205, 206, 207</sup> was unable to find in pregnant rats any change in either volume or size of the anterior lobe, and no "pregnancy cell" or other recognizable histologic departure from the nonpregnant. (Our concepts of the histology of the anterior hypophysis may now be considered as hopelessly muddled as any other phase of this complex subject.)

A cyclic variation in the gonad-stimulating potency of the anterior lobe, with a diminished capacity at the time of estrus, has been described for the sow (Wolfe<sup>229</sup>), and the rat (Siegmund<sup>193, 194</sup>). This characteristic is explained on the basis of estrin production and the inhibition of the anterior hypophysis which this hormone produces. Moore and Price<sup>141</sup> have given an extensive version of their important

studies on this problem, and further evidence also has been advanced by other workers who have succeeded in preventing castration changes in the anterior lobe of various species by the administration of estrin (Hohlweg and Dohrn;<sup>88, 89</sup> Nelson;<sup>145, 146</sup> Friedl<sup>59</sup>). Pincus and Werthessen<sup>158</sup> have corroborated the finding that prolonged injections of estrin to young rats inhibit ovarian growth, while Spencer, et al.<sup>204</sup> reported that this effect may be offset by the simultaneous injection of a hypophyseal growth factor or prolant.\* Kuschinsky<sup>109</sup> found a diminished hormone content of the hypophyses of adult female rats given prolant for ten days, while Klingler,<sup>100</sup> Klingler et al.,<sup>101</sup> Wolfe et al.<sup>238</sup> believe there is a factor in the human placenta which increases the size and gonad-stimulating power of the hypophysis, and corroboration of this observation is found in the enlargement of the anterior lobe of rats which results from the administration of the A.P.L. placental extract (Collip et al.<sup>24</sup>).

A postcastration increase in the gonad-stimulating power of the anterior hypophysis of the guinea pig has been reported by Severinghaus,<sup>187</sup> while Wolfe<sup>230</sup> found that this does not occur with the rabbit. Wolfe et al.<sup>239</sup> have described anterior hypophyseal changes in rats following extreme partial castration, and Emery<sup>38</sup> has demonstrated again the presence of a gonad-stimulating hormone in the blood and urine of spayed rats. McQueen-Williams<sup>140</sup> was unable to prevent castration changes by the administration of hypophyseal implants, but Targow<sup>212</sup> found that a growth extract caused a diminution of the weights of both lobes of the hypophysis of spayed rats.

On the basis of implantation experiments with various types of pituitary adenomas, Kraus<sup>104</sup> believes that, in the human, eosinophiles produce the sex hormone as well as basophiles. However, Zondek<sup>242, 244</sup> claims that the basophiles are the cells concerned since human posterior lobe tissue has gonad-stimulating properties and basophiles are the only type of anterior lobe cells present in this part of the organ.

#### YET ANOTHER SEX HORMONE OF THE ANTERIOR LOBE?

In my previous review of this series<sup>51</sup> attention was directed to the preliminary reports of Reichert et al.<sup>162, 163</sup> and Evans et al.<sup>43</sup> that prolant was singularly ineffective in hypophysectomized animals, but that gonadal stimulation could be obtained if an extract of hypophyseal growth hormone was given along with it. This activation was further demonstrated in immature rats by Evans, Meyer and Simpson,<sup>44</sup> who evolved the theory that prolant is of the nature of an "activator" which either converts an inactive "prohormone" in the hypophysis to an active form or else is able actually to convert the growth-stimulating into a gonad-stimulating principle. Leonard,<sup>115</sup> however, pointed out that this activation is not strictly characteristic of the growth hormone alone, since it could be obtained with a growth-free gonad-stimulating hypophyseal extract and Collip and his coworkers<sup>25</sup> then suggested that the complementary hypophyseal substance which is necessary for prolant to produce follicles and corpora in hypophysectomized rats is probably not identical with any of the known pituitary hormones. Evans, Simpson, and Austin<sup>45</sup> have subsequently brought forward evidence favoring the conception that the hypophyseal substance which produces increased gonadotropic effects when combined with prolant is neither the growth nor the gonad-stimulating factor, and is thus a new, hitherto unrecognized principle.

\*The name "prolant" was originally applied to a preparation made from urine of pregnant women and is now frequently employed as referring also to gonad-stimulating substances obtained from pituitary glands. In this review, it is used solely for the gonad-stimulating hormone of pregnancy, whether found in the urine, blood, or placenta, an interpretation which has been given to it by a number of American investigators.

THE RELATION OF GONAD-STIMULATING HORMONES FROM PREGNANT WOMEN  
TO THE ANTERIOR PITUITARY SEX FACTOR

One of the most important and vexatious questions relating to this general problem is that dealing with the relation of the gonad-stimulating hormone from pregnant women to the anterior hypophysis. It was originally assumed by the German school that prolan from urine of pregnant women is an anterior pituitary hormone, and this conception has received widespread acceptance in spite of the warnings soon given by Engle, Orban and Watrin, and Collip, that although these substances are similar they might not be identical. Unfortunately a solution has not been reached, and although no convincing evidence has been advanced showing that prolan is an anterior pituitary hormone the past two years have brought a convincing array of facts demonstrating important fundamental differences in the properties of the two substances.

1. In the first place, Reichert et al.<sup>162, 163</sup> showed that prolan is relatively ineffective in producing ovarian changes in hypophysectomized animals, an observation which soon received confirmation (Wallen-Lawrence and Van Dyke<sup>217</sup>). Although some differences exist as to details it seems established that prolan in hypophysectomized rats produces extensive luteinization of thecal cells with increase of interstitial tissue and the induction of estrous changes in the vagina (Noguchi,<sup>149</sup> Collip et al.,<sup>23</sup> Wade et al.,<sup>216</sup> Smith and Leonard,<sup>198, 120</sup> Leonard, Kurzrok and Smith<sup>119</sup>), a finding which is in striking contrast to the development of follicles and corpora lutea which can be induced by anterior lobe implants in hypophysectomized rats or dogs (Smith, Reichert). (A difference apparently exists as to the effect of prolan in the rabbit, since Hill and Parkes,<sup>77</sup> and White and Leonard<sup>221</sup> succeeded in producing ovulation after hypophysectomy. It has been shown experimentally by Markee and Hinsey<sup>136</sup> that the reason for this probably lies in the fact that these workers injected the pregnancy urine at about the time of operation when some anterior pituitary substance was still present in the animals.)

2. The second important difference between prolan and anterior lobe sex hormone lies in the comparative inability of the former to induce great increases in the ovarian weight of immature rats in short experiments. This was demonstrated with A.P.L. extract by Collip et al.,<sup>26, 27</sup> and Evans, Meyer and Simpson<sup>44</sup> showed that in spite of increasing the dose of a prolan extract a certain level was reached beyond which increases in weight could not be obtained in *five-day experiments*, an observation confirmed by using a pregnancy blood extract (Fluhmann<sup>55</sup>), and urine (Emery<sup>37</sup>).

3. Although anterior hypophyseal sex hormone readily produces increases in the weight of the testes of chicks or immature pigeons, prolan is ineffective in this regard (Riddle and Polhemus;<sup>173</sup> confirmed by Reiss, Pick and Winter;<sup>166</sup> Leonard;<sup>118</sup> and Leonard, Kurzrok and Smith<sup>119</sup>).

4. While it has been possible to produce in monkeys follicle growth and resultant estrin effects such as enlargement of the uterus or sex skin changes by the use of anterior lobe implants (Hartman and Squier<sup>71</sup>) or extracts (Hisaw, Fevold and Leonard<sup>83, 84</sup>), and luteinization of the ovaries with higher doses of a pyridine extract (Hisaw et al.<sup>85</sup>), the administration of prolan even at high doses and for long periods of time does not produce any follicle development in the ovaries (Novak and Kun,<sup>153</sup> Ehrhardt,<sup>35</sup> Engle,<sup>41</sup> Diddle and Allen<sup>32</sup>). Of interest, also, is the production of uterine bleeding in monkeys by both prolan and an anterior pituitary extract and an apparent difference in the mechanism by which it was brought about. In the case of prolan the bleeding took place during the course of the treatment (Engle<sup>40, 42</sup>), while with the anterior lobe extract it occurred

from four to nine days after cessation of the injections (Saiki<sup>179</sup>), thus suggesting estrin withdrawal as the cause of the hemorrhage. (Saiki has also made an important contribution in pointing out that he failed to produce bleeding in castrates by this method.)

5. Prolan stimulates the testis and ovary with equal facility, while ovary-stimulating hormones of the anterior lobe stimulate the ovary in a much smaller dose than that having a moderate effect on the testis (Wallen-Lawrence and Van Dyke<sup>217</sup>).

6. During pseudopregnancy induced in the rabbit by single injections of anterior lobe substance or urine of pregnant women there was found a luteinization of the ovaries, a progestational proliferation of the endometrium, and an inhibition of the *in vitro* reaction of uterine muscle to posterior pituitary extract (Robson<sup>174</sup>). The same phenomena could be produced by daily injections of pregnancy urine extract, but the daily injection of anterior lobe substance resulted in luteinization of the ovaries and progestational proliferation without the inhibition of the posterior pituitary reaction (Robson<sup>175</sup>).

7. Prolan cannot induce a superovulation in the rat or mouse such as can be readily done with anterior pituitary implants (Shelesnyak and Engle<sup>191</sup>).

8. The dose of an anterior pituitary extract necessary to produce ovulation in rabbits is very much less than that of prolan when the potency of these two substances is standardized on immature female rats (Leonard<sup>116, 117</sup>).

9. The administration of A.P.L. placental extract (McPhail, quoted by Collip<sup>22</sup>) or a pregnancy blood extract (Fluhmann<sup>55</sup>) for periods of three to four weeks produced a progressive increase in the ovarian weights of immature rats. With an anterior pituitary extract, at doses which stimulate increases of from 100 to 500 per cent in ovarian weight in the first five days, no further increase could be induced even when the daily injections were continued for twenty days (Fluhmann<sup>56</sup>).

10. The administration of a known total dose of a pregnancy blood extract over periods of ten, fifteen, or twenty days produced a much greater increase in ovarian and uterine weights of immature rats than when the same total dose was given in five days. The opposite result was obtained with acid extracts of sheep anterior pituitary glands, as the injection of a known dose in five days produced a greater increase in ovarian weight than when the administration of the same total dose was spread out over periods of ten, fifteen, or twenty days (Fluhmann<sup>57</sup>).

#### FURTHER OBSERVATIONS ON THE GONAD-STIMULATING HORMONE OF PREGNANT WOMEN

In addition to the data presented in the preceding section a number of important observations on prolan have been made, and until the relation between these hormones is more clearly understood they should be considered separately from the experimental results obtained with anterior lobe substances.

The demonstration by Friedman that ovulation may be induced in rabbits by the intravenous injection of pregnancy urine stirred up a great deal of interest, and a number of exhaustive studies have been conducted on various phases of this problem (Snyder and Wislocki,<sup>201</sup> Friedman,<sup>60</sup> Wolfe and Ellison,<sup>237</sup> Jares,<sup>91</sup> Hill and Parkes,<sup>79</sup> Winter<sup>225</sup>). Friedman<sup>61, 62</sup> has succeeded in inducing ovulation unilaterally by the direct intrafollicular injection of pregnancy urine extracts. Reynolds<sup>169</sup> found that a small amount of the ovary-stimulating hormone from pregnancy urine may induce a transitory decrease in the motility of the uterus of the unanesthetized rabbit, and as in the case of the anterior lobe he believes that this is a direct effect on the uterus. Westman<sup>219</sup> was able to prolong the period of pseudopregnancy in the rabbit by the injection of prolan, and Fluhmann<sup>52, 53</sup> has dem-



onstrated that during pseudopregnancy or after the injection of estrin the rabbit's uterus reacts to trauma with macrophages much more intensively than under normal conditions.

The injection of pregnancy urine extract to ten-day-old rats produced no important follicle development but an increase in the size of the ovaries due to a growth of interstitial tissue according to Dorfmueller and de Fremery,<sup>33</sup> while Selye and Collip<sup>184</sup> obtained in very young rats an extensive thecal luteinization and continuous estrus with the A.P.L. placental extract. Hill<sup>76</sup> found that larger doses of pregnancy urine are necessary to elicit a response in mice of fourteen than of twenty-one days of age. The production of thecal luteinization after the administration of prolan to guinea pigs has been described by Loeb,<sup>129</sup> Aron,<sup>4</sup> Selye, Collip and Thomson,<sup>185</sup> and King.<sup>99</sup> Mandelstamm and Tsch aikowsky<sup>184</sup> produced sterility in female mice by the administration of prolan, but Rosenblatt, Halber and Pruszyński<sup>176</sup> were unable to produce such hormonal sterilization in either mice or rabbits. Katzman<sup>95</sup> has pointed out that although the prolonged administration of prolan results in profound ovarian luteinization there is no permanent impairment of the reproductive mechanism, an observation corroborated by Zondek.<sup>245</sup> Reiss,<sup>164</sup> and Reiss, Druckrey and Fischl<sup>165</sup> have reported that the basal metabolism (studied by Warburg's method) of ovaries stimulated to growth by prolan, increased markedly, and this increase was apparent before the morphologic changes set in. Zondek, Zondek and Hartoch<sup>246</sup> have inhibited the growth of transplantable carcinoma in mice by the injection of prolan, while Gross<sup>87</sup> obtained a stimulation of the growth of a transplantable sarcoma and considered it a nonspecific effect. Küstner<sup>110</sup> found that prolan was destroyed by exposure to ultraviolet rays and its activity was increased by red light, while Wirz and Goecke<sup>227</sup> could not produce an intensification of prolan effects by unilateral oophorectomy of the experimental animal. Shelesnyak<sup>190</sup> produced deciduomas in young rats treated with pregnancy urine, and the effects of this hormone in adult mice have been studied by Hirsch-Hoffmann.<sup>82</sup> Hill and Parkes<sup>78</sup> have found some indication of a separation of luteinizing and maturing activity by alcohol fractionation of urine extracts. Bacq and Brouha<sup>5</sup> found no interference with the action of pregnancy urine after sympathetic denervation.

Collier and Wade<sup>21</sup> have presented one of the first studies on the characteristics of gonad-stimulating extracts made from the urine of human castrates and normal individuals, and reported a relation between the effects they induced and those brought about by prolan injections. Snyder and Wislocki<sup>200</sup> were unable to demonstrate gonad-stimulating factors in the urine of pregnant macaque monkeys, rabbits, cats, rats, or dogs, and Bunster<sup>11</sup> could not induce ovulation in the rabbit by blood transfusions from pregnant does. Of especial interest, however, is the gonad-stimulating principle found in the blood of pregnant mares and further important observations on its effect in male and female rats, ewes and sows have been made by Cole, Guilbert and Goss<sup>19</sup> and Cole and Miller<sup>20</sup> while Catchpole and Lyons<sup>15</sup> have investigated quantitatively its distribution in maternal and fetal horse tissues.

#### TECHNICAL PROCEDURES

In view of the widespread interest aroused by problems dealing with the physiology of the hypophysis and the ovaries, it was inevitable that during the past two years many technical procedures facilitating or improving research activities should be presented. A method of performing hypophysectomy in the monkey has been described by Firor,<sup>48</sup> and Thompson<sup>213</sup> has presented a technic for this operation in the rat. Cleveland and Wolfe<sup>18</sup> and Sevringhaus<sup>186</sup> have given new methods for the differential staining of the cells of the anterior hypophysis. Nu-

merous procedures have been devised for the preparation of ovary-stimulating extracts from anterior lobe tissue (Wallen-Lawrence and Van Dyke;<sup>214, 217</sup> Wiesner and Marshall;<sup>223</sup> Fevold et al.;<sup>47</sup> Evans, Simpson and Austin<sup>45</sup>); from urine of pregnant women (Schmidt and Derankowa;<sup>182</sup> Wiesner and Marshall;<sup>223</sup> Wallen-Lawrence and Van Dyke;<sup>217</sup> Katzman and Doisy;<sup>96, 97, 98</sup> Davy and Sevringhaus<sup>30</sup>); from human placenta (Collip and coworkers;<sup>26, 27</sup> Wiesner and Marshall<sup>223</sup>); and from blood of pregnant women (Neumann and Peter;<sup>147</sup> Fluhmann<sup>54</sup>); while additional chemical data on various gonad-stimulating hormones have been presented by Spaul and Myddleton,<sup>203</sup> Schmidt and Derankowa,<sup>181</sup> Reiss, Schöffner and Haurowitz,<sup>167</sup> Marshall.<sup>137</sup>

### CLINICAL STUDIES

In a previous communication (Fluhmann<sup>58</sup>) it was stated that three important advances in clinical work have resulted from these studies, namely, (1) the development of an important test for the diagnosis of pregnancy and the control of the treatment of chorioepithelioma and hydatidiform mole, (2) the employment of hormone tests as a new method of approach for the study of certain endocrinologic conditions, and (3) the use of ovary-stimulating hormones for the successful treatment of the uterine hemorrhages accompanying hyperplasia of the endometrium.

During the past two years numerous reports have appeared further corroborating the accuracy of the Aschheim-Zondek pregnancy test, and Friedman's modification calling for the use of rabbits has rightly become the most popular procedure at least in this country. A number of quantitative studies on the amount of prolactin in the blood or urine during pregnancy have been reported. Brindeau, Hinglais and Hinglais<sup>8</sup> have found a maximum concentration of prolactin in the blood serum during the first trimester of pregnancy, while Runge, Hartmann and Sievers<sup>178</sup> found very little difference in the urinary excretion between early and late pregnancy although this amount may vary greatly during the course of gestation. Murphy<sup>142</sup> noted that the variations in urine output do not influence the total amount of hormone excreted while Runge and Clausnitzer<sup>177</sup> observed a persistence of prolactin excretion for some days after intrauterine fetal death. Winter<sup>224</sup> reported a marked increase of prolactin in the urine of a patient with a hypophyseal tumor complicating pregnancy.

A number of important clinical observations dealing with pituitary-ovarian interrelationship have been published. Cushing<sup>28, 29</sup> has given an exhaustive study of pituitary adenomas and described the clinical manifestations of basophile adenomas including their relation to ovarian function. Siedentopf<sup>192</sup> has cited an unusual condition in a woman who failed to menstruate in spite of a normal ovarian cycle, and since she developed uterine bleeding after treatment with prolactin he considered this as evidence of a direct effect of the anterior lobe on the uterus. Burch et al.<sup>12</sup> considered the hypophysis involved in the etiology of hyperplasia endometrii, while Kraus<sup>103, 106</sup> found a relation between cystic degeneration of the ovaries and prolonged increased intracranial pressure associated with an excessive production of anterior lobe sex hormone. Lambie and Wiesner<sup>111</sup> have given an extensive, complicated and certainly premature discussion of the relation between the hormones of the anterior lobe of the pituitary gland and clinical syndromes. Bennett<sup>6</sup> has given the hormone findings in an instance of pubertas precox in a girl of four, while Koller<sup>102</sup> found a hyperemia and increase of lutein tissue in the ovaries of a patient with a thrombophlebitis of the sinus cavernosus accompanied by an acute inflammatory condition of the anterior hypophysis.

In the two previous reviews of this series (Fluhmann<sup>50, 51</sup>) analyses were made of reports dealing with the presence of ovary-stimulating hormones in the blood or urine of women with certain types of amenorrhea, following operative or radiation

castration, and in the postclimacteric period, and a number of papers have recently appeared corroborating these findings (Jeffcoate,<sup>92</sup> Mazer and Andrussier,<sup>138</sup> Brühl,<sup>10</sup> Österreichher,<sup>154, 156</sup> Zondek,<sup>243</sup> Gostimirove,<sup>64</sup> Bompiani,<sup>7</sup> Wirz<sup>226</sup>). Kurzrok<sup>107, 108</sup> has made use of such a procedure along with estrin tests as an index of therapy in menstrual dysfunction. Neumann and Peter<sup>148</sup> found anterior lobe hormone in the blood of women (no details given) during the premenstruum, at which time Zondek<sup>241</sup> observed a maximum urine excretion, while Österreichher<sup>155</sup> obtained a positive test in only 3 out of 60 observations in normal individuals. Katzman and Doisy<sup>97</sup> have made an important quantitative determination of the daily output of ovary-stimulating hormone in various individuals. Soeken<sup>202</sup> obtained positive tests from the urine of 24 out of 50 children, but Schörcher<sup>183</sup> obtained negative results in 47 cases. Kaiser<sup>94</sup> found a positive Aschheim-Zondek test in a patient with a large parovarian cyst, Siegmund<sup>196</sup> in a six-year-old child with pubertas precox associated with a chorionepitheliomatous ovarian tumor, and Froboese and Zondek<sup>63</sup> in an infant with a large retroperitoneal teratoma. Considerable discussion has centered on the presence of ovary-stimulating hormones in the urine of patients with acromegaly, hypophyseal tumors, or cases with prolonged increase of intracranial pressure, positive results having been reported by v. Morgitay-Becht and Miklos,<sup>215</sup> Kraus,<sup>105</sup> and Hirsch-Hoffmann,<sup>81</sup> but Watts,<sup>218</sup> and Fels<sup>46</sup> have obtained negative results. The latter believes that in such cases anterior lobe sex hormone is probably only found in the urine of patients with basophilic adenomas of the anterior hypophysis.

An interesting editorial in the *Lancet*<sup>34</sup> suggests that before ovary-stimulating hormones come into widespread clinical use, more information based on experimental work should be obtained. (It might be added that a more thorough understanding of the conditions treated would also be of assistance.) However, it would seem that the use of prolan for the treatment of uterine hemorrhage, and especially in patients with hyperplasia endometrii, has proved of value in a large percentage of cases and further evidence of this claim has been advanced by Novak and Hurd,<sup>151</sup> Laquer,<sup>112</sup> Johnstone, Wiesner and Marshall,<sup>93</sup> Schildberg,<sup>180</sup> Campbell<sup>14</sup> and others, while Clauberg<sup>17</sup> has suggested the use of blood transfusion from pregnant donors, a procedure which should be of value in emergency instances. On the other hand, a perusal of reports regarding the use of prolan in "hypoovarian conditions" as manifested by amenorrhea, irregular delayed menses, and hypomenorrhea, leaves one with the impression that final judgment as to its true value should be delayed, some authors claiming a large percentage of cures, others almost total failures, and practically no one giving complete records of careful, well-controlled studies (Purpus,<sup>159</sup> Laroche and Simmonet,<sup>113</sup> Johnstone, Wiesner and Marshall,<sup>93</sup> Schildberg,<sup>180</sup> Wiegels,<sup>222</sup> Gragert,<sup>65</sup> Sevringhaus and Thornton,<sup>188</sup> and others). Zondek<sup>240</sup> has reported successful prolan therapy in a series of patients with pelvic inflammatory disease, and Fluhmann<sup>52, 53</sup> has given a logical explanation for this method of treatment in the experimental demonstration of an increased macrophage response of the rabbit's uterus following hormonal stimulation with either prolan or estrin. Novak<sup>150</sup> and Novak and Reynolds<sup>152</sup> have discussed the problem of dysmenorrhea and suggested the use of prolan for this condition, but Campbell<sup>14</sup> reported that such symptoms are intensified by the administration of prolan (A.P.L. placental extract). Campbell<sup>14</sup> has also found an alleviation of menopausal symptoms and mastalgia by the use of A.P.L. extract. Mandelstamm and Tschakowsky<sup>135</sup> have found characteristic changes in the ovaries of patients given prolan before operation, an important contribution which awaits confirmation.

In conclusion, reference must be made to two books dealing with various phases of this subject which have appeared in the last two years, and which deserve special commendation. In the first (Allen<sup>1</sup>) the advanced student will find an authoritative

discussion of the subject as it stands to date by recognized American authorities, and in the second (Mazer and Goldstein<sup>139</sup>) the practitioner will find a fundamental exposition of the relation of recent advances to clinical work which should prove of much assistance.

## REFERENCES

- (1) Allen, E.: Sex and Internal Secretions, Williams & Wilkins Company, Baltimore, 1932. (2) Aron, M.: Compt. rend. Soc. de Biol. 108: 25, 1931. (3) *Idem*: Compt. rend. Soc. de Biol. 108: 1218, 1931. (4) *Idem*: Compt. rend. Soc. de Biol. 111: 34, 1932. (5) Bacq, Z. M., and Brouha, L.: Compt. rend. Soc. de Biol. 107: 546, 1932. (6) Bennett, C. L.: Endocrinology 16: 529, 1932. (7) Bompiani, R.: Abst. Ber. ü. d. ges. Gynäk. u. Geburtsh. 23: 98, 1932. (8) Brindeau, A., Hinglais, H., and Hungar, M.: Compt. rend. Soc. de Biol. 111: 988, 1933. (9) Brouha, L.: Gynec. et Obstét. 24: 653, 1-31. (10) Brühl, R.: Ztschr. f. Geburtsh. u. Gynäk. 101: 403, 1932. (11) Bunster, E.: Bull. Johns Hopkins Hosp. 51: 329, 1932. (12) Burch, J. C., Williams, W. L., Wolfe, J. M., and Cunningham, R. S.: J. A. M. A. 97: 1859, 1931. (13) Butcher, E. O.: Anat. Rec. 54: suppl. p. 50, 1932. (14) Campbell, A. D.: Lancet 223: 561, 1932. (15) Catchpole, H. R., and Lyons, W. R.: Anat. Rec. 55: suppl. p. 48, 1933. (16) Charipper, H. A., and Taylor, G. W.: Anat. Rec. 55: suppl. p. 37, 1931. (17) Claiberg, C.: Zentralbl. f. Gynäk. 57: 47, 1933. (18) Cleveland, R., and Wolfe, J. M.: Anat. Rec. 55: 409, 1932. (19) Cole, H. H., Guibert, H. R., and Goss, H.: Am. J. Physiol. 102: 227, 1932. (20) Cole, H. H., and Miller, R. F.: Am. J. Physiol. 104: 165, 1933. (21) Collier, W. D., and Wade, N. J.: Proc. Soc. Exper. Biol. & Med. 30: 1191, 1933. (22) Collip, J. B.: Internat. Clin. 4: 51, 1932. (23) Collip, J. B., Selye, H., and Thomson, D. L.: Nature 131: 56, 1933. (24) Collip, J. B., Selye, H., Thomson, D. L., and Williamson, J. E.: Proc. Soc. Exper. Biol. & Med. 30: 590, 1933. (25) *Idem*: Proc. Soc. Exper. Biol. & Med. 30: 665, 1933. (26) Collip, J. B., Thomson, D. L., McPhail, M. K., and Williamson, J. E.: Canad. M. A. J. 24: 201, 1931. (27) Collip, J. B., Thomson, D. L., Browne, J. S. L., McPhail, M. K., and Williamson, J. E.: Endocrinology 15: 315, 1931. (28) Cushing, H.: Bull. Johns Hopkins Hosp. 50: 137, 1932. (29) *Idem*: Arch. Int. Med. 51: 487, 1933. (30) Davy, L., and Sevringhaus, E. L.: Proc. Soc. Exper. Biol. & Med. 30: 1422, 1933. (31) Desclin, L.: Compt. rend. Soc. de Biol. 111: 1085, 1933. (32) Diddle, A. W., and Allen, E.: Anat. Rec. 55: suppl. p. 54, 1933. (33) Dorfmueller, Th., and de Fremery, P.: Abst. Bericht. ü. d. ges. Gynäk. 22: 780, 1932. (34) Editorial: Lancet 223: 525, 1932. (35) Ehrhardt, K.: Arch. f. Gynäk. 148: 235, 1932. (36) Ellison, E. T., Campbell, M., and Wolfe, J. M.: Anat. Rec. 52: suppl. p. 51, 1932. (37) Emery, F. E.: Endocrinology 17: 64, 1933. (38) *Idem*: Am. J. Physiol. 101: 246, 1932. (39) Engle, E. T.: Endocrinology 15: 405, 1931. (40) *Idem*: Proc. Soc. Exper. Biol. & Med. 29: 1224, 1932. (41) *Idem*: Proc. Soc. Exper. Biol. & Med. 30: 530, 1933. (42) *Idem*: Anat. Rec. 55: suppl. p. 15, 1933. (43) Evans, H. M., Meyer, K., and Simpson, M. E.: Proc. Soc. Exper. Biol. & Med. 28: 845, 1931. (44) *Idem*: Am. J. Physiol. 100: 141, 1932. (45) Evans, H. M., Simpson, M. E., and Austin, P. R.: J. Exper. Med. 57: 897, 1933. (46) Fels, E.: Klin. Wehnschr. 12: 504, 1933. (47) Fevold, H. L., Hisaw, F. L., Hellbaum, A., and Hertz, R.: Am. J. Physiol. 104: 710, 1933. (48) Firor, W. M.: Bull. Johns Hopkins Hosp. 50: 33, 1932. (49) *Idem*: Am. J. Physiol. 101: 204, 1933. (50) Fluhmann, C. F.: Am. J. Obst. & Gynec. 18: 738, 1929. (51) *Idem*: Am. J. Obst. & Gynec. 22: 803, 1931. (52) *Idem*: Proc. Soc. Exper. Biol. & Med. 29: 1027, 1932. (53) *Idem*: Am. J. Obst. & Gynec. 24: 654, 1932. (54) *Idem*: Proc. Soc. Exper. Biol. & Med. 29: 1193, 1932. (55) *Idem*: Proc. Soc. Exper. Biol. & Med. 30: 149, 1932. (56) *Idem*: Proc. Soc. Exper. Biol. & Med. 30: 881, 1933. (57) *Idem*: Proc. Soc. Exper. Biol. & Med. 30: 1014, 1933. (58) *Idem*: Ann. Int. M-d. 6: 1212, 1933. (59) Friedl, F.: Ztschr. f. Geburtsh. u. Gynäk. 105: 227, 1933. (60) Friedman, M. H.: J. Pharmacol. & Exper. Therap. 45: 7, 1932. (61) *Idem*: Am. J. Physiol. 99: 332, 1932. (62) *Idem*: Am. J. Physiol. 101: 482, 1932. (63) Froboese, A. G., and Zondek, B.: Deutsche. med. Wehnschr. 57: 1765, 1931. (64) Gostimirov, D.: München. med. Wehnschr. 79: 1103, 1932. (65) Gragert, O.: Zentralbl. f. Gynäk. 56: 2463, 1932. (66) Green, R.: Proc. Soc. Exper. Biol. & Med. 30: 1362, 1933. (67) Gross, L.: Ztschr. Krebsforsch. 36: 606, 1932. (68) Gutowska, M. S.: Quart. J. Exper. Physiol. 21: 197, 1931. (69) Guyenot, E., Ponce, K., Fehr, A., and Moszkowska, A.: Compt. rend. Soc. de Biol. 110: 19, 1932. (70) Guyer, M. F., and Claus, P. E.: Anat. Rec. 52: 225, 1932. (71) Hartman, C. G., and Squier, R. R.: Anat. Rec. 50: 267, 1931. (72) Haterius, H. O.: Proc. Soc. Exper. Biol. & Med. 29: 962, 1932. (73) *Idem*: Anat. Rec. 54: 343, 1932. (74) Hellbaum, A. A.: Proc. Soc. Exper. Biol. & Med. 30: 641, 1933. (75) Hertz, R., Hellbaum, A., and Hisaw, F. L.: Proc. Soc. Exper. Biol. & Med. 30: 41, 1932. (76) Hill, M.: J. Physiol. 75: 44, 1932. (77) Hill, M., and Parkes, A. S.: Proc. Roy. Soc. Lond., B 107: 30, 1930. (78) *Idem*: Proc. Roy. Soc. Lond., B 107: 455, 1931. (79) *Idem*: Proc. Roy. Soc. Lond., B 110: 180, 1932. (80) *Idem*: Proc. Roy. Soc. Lond., B 112: 153, 1932. (81) Hirsch-Hoffmann, H. U.: Klin. Wehnschr. 11: 94, 1932. (82) *Idem*: Zentralbl. f. Gynäk. 56: 2538, 1932. (83) Hisaw, F. L., Fevold, H. L., and Leonard, S. L.: Anat. Rec. 51: suppl. p. 18, 1931. (84) *Idem*: Proc. Soc. Exper. Biol. & Med. 29: 204, 1931. (85) Hisaw, F. L., Hertz, R., Hellbaum, A., and Fevold, H. L.: Proc. Soc. Exper. Biol. & Med. 30: 39, 1932. (86) *Idem*: Anat. Rec. 55: suppl. p. 19, 1933. (87) Hogben, L., and Charles, E.: J. Exper. Biol. 9: 139, 1932. (88) Hohweg, W., and Dohrn, M.: Wien. Arch. f. inn. Med. 21: 337, 1931. (89) *Idem*: Klin. Wehnschr. 11: 233, 1932. (90) Janssen, S., and Loeser, A.: Arch. f. exper. Path. u. Pharmacol. 159: 737, 1931. (91) Jares, J. L.: Am. J. Physiol. 101: 545, 1932. (92) Jeffcoate, T. N. A.: Lancet 222: 662, 1932. (93) Johnston, R. W., Wiesner, B. P., and Marshall, P. G.: Lancet 223: 509, 1932. (94) Kahn, K.: Zentralbl. f. Gynäk. 57: 266, 1933. (95) Katzman, P. A.: Proc. Soc. Exper. Biol. & Med. 29: 700, 1932. (96) Katzman, P. A., and Doisy, E. A.: J. Biol. Chem. 98: 739, 1932. (97) *Idem*: Proc. Soc. Exper. Biol. & Med. 30: 1188, 1933. (98) *Idem*: Proc. Soc. Exper. Biol. & Med. 30: 1196, 1933. (99) King, A. G.: Proc. Soc. Exper. Biol. & Med. 30: 1182, 1933. (100) Klingler, H.: Anat. Rec. 52: suppl. p. 61, 1932. (101) Klingler, H., Burch, J. C., and Cunningham, R. S.: Surg.

- Gynec. Obst. 56: 137, 1933. (102) *Koller, F.*: Endokrinol. 12: 401, 1933. (103) *Kraus, E. J.*: Med. Klin. 27: 547, 1931. (104) *Idem*: Klin. Wchnschr. 11: 1020, 1932. (105) *Idem*: Klin. Wchnschr. 11: 1577, 1932. (106) *Idem*: Arch. f. Gynäk. 152: 383, 1933. (107) *Kurczok, R.*: Anat. Rec. 52: suppl. p. 22, 1932. (108) *Idem*: Endocrinology 16: 361, 1932. (109) *Kuschinsky, G.*: Arch. f. exper. Path. u. Pharmakol. 162: 183, 1931. (110) *Küstner, H.*: Ztschr. f. Geburtsh. u. Gynäk. 103: 305, 1932. (111) *Lambie, C. G., and Wiesner, B. P.*: Edinburgh M. J. 38: 605, 1931. (112) *Laquer, F.*: Brit. M. J. 2: 1168, 1931. (113) *Laroche, G., and Simonnet, H.*: Presse méd. 40: 710, 1932. (114) *Leonard, S. L.*: Am. J. Physiol. 98: 406, 1931. (115) *Idem*: Proc. Soc. Exper. Biol. & Med. 30: 403, 1932. (116) *Idem*: Proc. Soc. Exper. Biol. & Med. 29: 812, 1932. (117) *Idem*: Anat. Rec. 55: suppl. p. 26, 1933. (118) *Idem*: Proc. Soc. Exper. Biol. & Med. 30: 1251, 1933. (119) *Leonard, S. L., Kurczok, R., and Smith, P. E.*: Anat. Rec. 55: suppl. p. 64, 1933. (120) *Leonard, S. L., and Smith, P. E.*: Proc. Soc. Exper. Biol. & Med. 30: 1248, 1933. (121) *Lepine, P.*: Compt. rend. Soc. de Biol. 107: 127, 1931. (122) *Lipschütz, A.*: Compt. rend. Soc. de Biol. 108: 646, 1931. (123) *Idem*: Compt. rend. Soc. de Biol. 109: 92, 1932. (124) *Idem*: Compt. rend. Soc. de Biol. 111: 610, 1932. (125) *Idem*: Arch. f. d. ges. Physiol. 231: 336, 1932. (126) *Lipschütz, A., and Reyes, G.*: Compt. rend. Soc. de Biol. 109: 1330, 1932. (127) *Idem*: Compt. rend. Soc. de Biol. 111: 608, 1932. (128) *Loeb, L.*: Proc. Soc. Exper. Biol. & Med. 29: 1128, 1932. (129) *Idem*: Endocrinology 16: 129, 1932. (130) *Idem*: Proc. Soc. Exper. Biol. & Med. 30: 1330, 1933. (131) *Idem*: Proc. Soc. Exper. Biol. & Med. 30: 1335, 1933. (132) *Loeb, L., and Friedman, H.*: Proc. Soc. Exper. Biol. & Med. 29: 172, 1931. (133) *Idem*: Proc. Soc. Exper. Biol. & Med. 30: 741, 1933. (134) *Mandelstamm, A., and Tschakowsky, W. K.*: Zentralbl. f. Gynäk. 55: 3004, 1931. (135) *Idem*: Arch. f. Gynäk. 151: 686, 1932. (136) *Markee, J. E., and Hinsey, J. C.*: Anat. Rec. 55: suppl. p. 67, 1933. (137) *Marshall, P. B.*: Quart. J. Exper. Physiol. 21: 315, 1932. (138) *Mazer, C., and Andrusier, I.*: Am. J. Obst. & Gynec. 22: 44, 1932. (139) *Mazer, C., and Goldstein, L.*: Clinical Endocrinology of the Female, W. B. Saunders Company, Philadelphia, 1932. (140) *McQueen-Williams, M.*: Anat. Rec. 55: suppl. p. 65, 1933. (141) *Moore, C. R., and Price, D.*: Am. J. Anat. 50: 13, 1932. (142) *Murphy, D. P.*: Surg. Gynec. Obst. 56: 914, 1933. (143) *Nelson, W. O.*: Anat. Rec. 52: suppl. p. 70, 1932. (144) *Idem*: Am. J. Anat. 52: 307, 1933. (145) *Idem*: Anat. Rec. 55: suppl. p. 31, 1933. (146) *Idem*: Anat. Rec. 55: suppl. p. 70, 1933. (147) *Neumann, H. O., and Peter, F.*: Klin. Wchnschr. 10: 2086, 1931. (148) *Idem*: Zentralbl. f. Gynäk. 56: 391, 1932. (149) *Noguchi, K.*: Jap. J. M. Sc. Pharmacol. 5: 104, 1931. Quoted by Collip et al.<sup>23</sup> (150) *Novak, E.*: Am. J. Obst. & Gynec. 24: 319, 1932. (151) *Novak, E., and Hurd, G. B.*: Am. J. Obst. & Gynec. 22: 501, 1931. (152) *Novak, E., and Reynolds, S. R. M.*: J. A. M. A. 99: 1466, 1932. (153) *Novak, J., and Kum, H.*: Wien. Arch. f. inn. Med. 21: 359, 1931. (154) *Österreicher, W.*: Klin. Wchnschr. 11: 813, 1932. (155) *Idem*: Klin. Wchnschr. 12: 538, 1933. (156) *Idem*: Klin. Wchnschr. 12: 896, 1933. (157) *Pencharz, R. I., and Long, J. A.*: Science 74: 206, 1931. (158) *Pincus, G., and Werthessen, N.*: Am. J. Physiol. 103: 631, 1933. (159) *Purpus, E.*: Abst. Ber. u. d. ges. Gynäk. 22: 780, 1932. (160) *Rasmussen, A. T.*: Anat. Rec. 55: suppl. p. 34, 1933. (161) *Reese, J. D.*: Anat. Rec. 52: suppl. p. 74, 1932. (162) *Reichert, F. L., Pencharz, R. I., Simpson, M. E., Meyer, K., and Evans, H. M.*: Proc. Soc. Exper. Biol. & Med. 28: 843, 1931. (163) *Idem*: Am. J. Physiol. 100: 157, 1932. (164) *Reiss, M.*: Med. Klin. 28: 992, 1932. (165) *Reiss, M., Druckrey, H., and Fischl, F.*: Endokrinologie 10: 241, 1932. (166) *Reiss, M., Pick, R., and Winter, K. A.*: Endocrinology 12: 18, 1933. (167) *Reiss, M., Schaffner, A., and Haurowitz, F.*: Endokrinologie 8: 22, 1931. (168) *Reynolds, S. R. M.*: Proc. Soc. Exper. Biol. & Med. 30: 59, 1932. (169) *Idem*: Am. J. Physiol. 100: 545, 1932. (170) *Reynolds, S. R. M., and Firor, W. M.*: Am. J. Physiol. 104: 331, 1933. (171) *Riddle, O.*: Endocrinology 15: 307, 1931. (172) *Riddle, O., Bates, R. W., and Dykshorn, S. W.*: Proc. Soc. Exper. Biol. & Med. 30: 794, 1933. (173) *Riddle, O., and Polhemus, I.*: Am. J. Physiol. 98: 121, 1931. (174) *Robson, J. M.*: Quart. J. Exper. Physiol. 22: 7, 1932. (175) *Idem*: Quart. J. Exper. Physiol. 22: 209, 1932. (176) *Rosenblatt, J., Halber, W., and Pruszczyński*: Monatschr. f. Geburtsh. u. Gynäk. 92: 284, 1932. (177) *Runge, H., and Clausnitzer, C.*: Zentralbl. f. Gynäk. 56: 2450, 1932. (178) *Runge, H., Hartmann, H., and Sievers, K.*: Arch. f. Gynäk. 149: 608, 1932. (179) *Saiki, S.*: Am. J. Physiol. 100: 8, 1932. (180) *Schildberg, W.*: Zentralbl. f. Gynäk. 50: 801, 1932. (181) *Schmidt, A. A., and Derankowa, E.*: Ztschr. f. d. ges. exper. Med. 78: 361, 1931. (182) *Idem*: Endokrinologie 11: 1, 1932. (183) *Schörcher, F.*: Klin. Wchnschr. 10: 2221, 1931. (184) *Selye, H., and Collip, J. B.*: Proc. Soc. Exper. Biol. & Med. 30: 647, 1932. (185) *Selye, H., Collip, J. B., and Thomson, D. L.*: Proc. Soc. Exper. Biol. & Med. 30: 780, 1933. (186) *Severinghaus, A. E.*: Anat. Rec. 53: 1, 1932. (187) *Idem*: Am. J. Physiol. 101: 309, 1932. (188) *Severinghaus, A. E., and Thornton, N. J.*: Endocrinology 17: 123, 1933. (189) *Shelesnyak, M. C.*: Am. J. Physiol. 98: 387, 1931. (190) *Idem*: Am. J. Physiol. 104: 693, 1933. (191) *Shelesnyak, M. C., and Engle, E. T.*: Anat. Rec. 53: 243, 1932. (192) *Siedentopf, H.*: Arch. f. Gynäk. 144: 455, 1931. (193) *Sigert, F.*: Arch. f. Gynäk. 152: 25, 1932. (194) *Idem*: Klin. Wchnschr. 12: 145, 1933. (195) *Siegmund, H.*: Zentralbl. f. Gynäk. 56: 953, 1932. (196) *Idem*: Arch. f. Gynäk. 149: 498, 1932. (197) *Smith, P. E.*: Anat. Rec. 52: 191, 1932. (198) *Smith, P. E., and Leonard, S. L.*: Anat. Rec. 55: suppl. p. 37, 1933. (199) *Smith, P. E., and White, W. E.*: J. A. M. A. 97: 1861, 1931. (200) *Snyder, F. F., and Wislocki, G. B.*: Bull. Johns Hopkins Hosp. 48: 362, 1931. (201) *Idem*: Bull. Johns Hopkins Hosp. 49: 106, 1931. (202) *Soeken, G.*: Ztschr. f. Kinderh. 53: 339, 1932. (203) *Spaul, E. A., and Middleton, W. M.*: J. Exper. Biol. 8: 30, 1931. (204) *Spencer, J., D'Amour, F. E., and Gustavson, R. G.*: Endocrinology 16: 647, 1932. (205) *Stein, S.*: Proc. Soc. Exper. Biol. & Med. 29: 282, 1931. (206) *Idem*: Anat. Rec. 52: suppl. p. 36, 1932. (207) *Idem*: Endocrinology 17: 187, 1933. (208) *Swezy, O.*: Oogenesis and its Relation to the Hypophysis, 1933. (209) *Swezy, O., and Evans, H. M.*: Anat. Rec. 54: suppl. p. 48, 1932. (210) *Swezy, O., and Pencharz, R. I.*: Anat. Rec. 54: suppl. p. 48, 1932. (211) *Idem*: California and West. Med. 38: 97, 1933. (212) *Targow, A. M.*: Proc. Soc. Exper. Biol. & Med. 30: 1126, 1933. (213) *Thompson, K. W.*: Endocrinology 16: 257, 1932. (214) *Van Dyke, H. B., and Wallen-Lawrence, Z.*: J. Pharmacol. & Exper. Therap. 47: 163, 1933. (215) *V. Morgitay-Becht, E., and Miklos, L.*: Klin. Wchnschr. 10: 2306, 1931. (216) *Wade, N. J., Katzman, E. A., and Jorgensen, M.*: Proc. Am. Soc. Biol. Chem. 96: 96, 1933. (217) *Wallen-Lawrence, Z., and Van Dyke,*

- H. B.: J. Pharmacol. & Exper. Therap. 43: 93, 1931. (218) Watts, J. W.: Proc. Soc. Exper. Biol. & Med. 29: 396, 1932. (219) Westman, A.: Zentralbl. f. Gynäk. 56: 450, 1932. (220) White, W. E.: Am. J. Physiol. 102: 505, 1932. (221) White, W. E., and Leonard, S. L.: Am. J. Physiol. 104: 44, 1933. (222) Wiegels, W.: Zentralbl. f. Gynäk. 56: 2409, 1932. (223) Wiesner, B. P., and Marshall, P. G.: Quart. J. Exper. Physiol. 21: 147, 1931. (224) Winter, E. W.: Arch. f. Gynäk. 147: 95, 1931. (225) Idem: Ztschr. f. Geburtsh. u. Gynäk. 101: 196, 1932. (226) Wirz, P.: Ztschr. f. Geburtsh. u. Gynäk. 104: 293, 1933. (227) Wirz, P. and Goecke, H.: Arch. f. Gynäk. 147: 751, 1931. (228) Wislocki, G. B., and Snyder, F. F.: Bull. Johns Hopkins Hosp. 49: 103, 1931. (229) Wolfe, J. M.: Am. J. Anat. 48: 391, 1931. (230) Idem: Am. J. Anat. 50: 351, 1932. (231) Wolfe, J. M., and Cleveland, R.: Anat. Rec. 51: 213, 1931. (232) Idem: Anat. Rec. 55: 233, 1933. (233) Idem: Anat. Rec. 55: suppl. p. 41, 1933. (234) Idem: Anat. Rec. 55: suppl. p. 84, 1933. (235) Idem: Anat. Rec. 56: 33, 1933. (236) Wolfe, J. M., Cleveland, R., and Campbell, M.: Ztschr. f. Zellforsch. u. mikr. Anat. 17: 420, 1933. (237) Wolfe, J. M., and Ellison, E. T.: Proc. Soc. Exper. Biol. & Med. 29: 600, 1932. (238) Wolfe, J. M., Phelps, D., and Cleveland, R.: Proc. Soc. Exper. Biol. & Med. 30: 1092, 1933. (239) Idem: Anat. Rec. 55: suppl. p. 85, 1933. (240) Zondek, B.: Deutsche med. Wehnschr. 57: 1855, 1931. (241) Idem: Klin. Wehnschr. 10: 2121, 1931. (242) Idem: AM. J. OBST. & GYNEC. 24: S36, 1932. (243) Idem: Klin. Wehnschr. 11: 1830, 1932. (244) Idem: Klin. Wehnschr. 12: 22, 1933. (245) Idem: Klin. Wehnschr. 12: S55, 1933. (246) Zondek, H., Zondek, B., and Hartoch, W.: Klin. Wehnschr. 11: 1785, 1932.

## Correspondence

### ON THE EPITHELIAL AND GLANDULAR MODIFICATIONS OF THE CERVIX DURING PREGNANCY

I have read with much interest the article by Prof. Hofbauer in the June, 1933, issue of the AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY on the manifestations of hyperplasia in both the surface mucosal epithelium and the glandular epithelium of the cervix in pregnant women.

Hofbauer states that, as far as he has been able to determine, these manifestations were hitherto unknown. He adds that his findings "may offer a new avenue of approach to the problem concerning the occurrence of cervical cancer in women who had previously been pregnant."

I want to take this opportunity to call attention to the fact that in 1910 (*Annali di Ostetricia e Ginecologia*) I made a systematic investigation into the histology of the cervix uteri during pregnancy.

I examined 90 cases, in all the different months of pregnancy, and studied separately the modifications of the connective tissue (decidual reaction), of the surface mucosal epithelium and of the glandular epithelium. I found deep modifications very similar to the ones described by Hofbauer. I had also reproduced several pictures of sections that closely resemble the beautiful photomicrographs of Hofbauer.

In 1927 I had these studies taken up by my assistant, Dr. Revoltella, who also studied carefully the histologic modifications during puerperium (*Rivista Italiana di Ginecologia*, 1927 and 1928).

In what concerns the pathogenical relations with cancer, I said in my papers of 1910, that the pregnancy modifications were like initial malignant lesions; however, I emphasized the fact that this had no pathologic significance, although there was little difference between them and the epithelial or glandular neoplasia. Moreover I saw in the tendency of pregnancy to determine epithelial atypical proliferations a new reason, hitherto unknown, that explains the predisposition of the multiparous women to cancer of the cervix. This hypothesis I worked up several times (*La Clinica Ostetrica*, 1928, 1933) and had it repeated by my assistants Cetroni and De Candia (*La Clinica Ostetrica*, 1929, 1932).

It is to be recognized that this is only a hypothesis. I desire however to establish the Italian priority as regards these objective histologic findings. The latter are interesting in themselves and ought to be further studied. I shall reserve for myself the pleasure of studying more accurately Hofbauer's new hypothesis concerning the relations with the hypophysis, and cancer prophylaxis, as well as other histologically interesting points of Hofbauer's work.

BARI, CLINICA GINECOLOGICA

JULY 7, 1933

PROF. PAOLO GAIFAMI.

#### A REPLY TO THE FOREGOING BY DR. HOFBAUER

It goes without saying that previous to the publication of our work on epithelial proliferation in the pregnant cervix, we went over the literature very carefully. Our modern standard textbooks of obstetrics, both in this country and abroad, do not mention any epithelial changes in the cervix during pregnancy. We also consulted Prof. R. Schroeder's recent comprehensive monograph *Weibliche Genitalorgane* (in *Handbuch der mikroskopischen Anatomie des Menschen*, von v. Möllendorff 7: part 1) and failed to find any statement relative to this subject. In Prof. Robert Meyer's book on *Histology and Pathology of the Female Sex Organs* (in *Handbuch der speciellen pathologischen Anatomie und Histologie*, 1930, vol. 7, part 1), there is a short note (p. 181) to the effect that during the second half of gestation Gaifami found paved epithelium ("Plattenepithel") in 42 per cent of his cases. This finding did not seem to me to have any bearing on our investigations.

Prof. Gaifami very kindly sent me, a few days ago, a reprint of his article. For this favor I feel much obliged to him since the Italian journal in which this article had appeared (in 1910) was not accessible to us; nor does the *Zentralblatt für Gynäkologie* contain an abstract of his work.

Our microphotographs and descriptions trace the beginning of the epithelial proliferation in the gravid cervix to the *third* month and show its mode of production. Furthermore, we place emphasis on *the penetration of the proliferating epithelium into abnormal locations*, inroads on connective tissue spaces, and on *the occurrence of dividing figures* in the proliferating epithelium, and also on *heteroplasia*. These particular changes are of blastomatoid character. It is our paper which described *these* phenomena for the first time.

Much as I admire Prof. Gaifami's initiative to correlate his findings with the possibility of later development of cervical cancer, so poignantly expounded in his articles, I did not dare to assume a dogmatic attitude in my more detailed paper. On the other hand, in a forthcoming experimental study the production of pre-cancerous lesions in the uterine cervix by hormonal stimuli will be demonstrated. Acknowledgment of these findings by no less an authority than Dr. James Ewing lends color to this new phase of studies in the realm of etiology of cervical cancer.

I. HOFBAUER, M.D.

BALTIMORE, MD.

AUGUST 25, 1933

# Department of Book Reviews

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CONDUCTED BY ROBERT T. FRANK

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## Reviews of New Books

### GYNECOLOGY

(Continued from October issue.)

The book written by Kappis on the *Prophylaxis and Treatment of Operative Dangers*<sup>s</sup> is well worth while. It assembles and digests much of what is known on these subjects, with full regard to our increased knowledge in normal and pathological physiology and biology. The surgical profession should be grateful to the author for his laborious work and for having assembled within the covers of one book what is generally known of this field which may be summed up under the resistance to versus the dangers of operation.

Of operative deaths 45 to 55 per cent are due to the underlying diseases as for example, carcinoma, peritonitis, severe injuries. Of possibly avoidable risks, pneumonia, bronchitis, lung abscesses, etc., take 17½ per cent of victims. In accord with others, the author finds an increase of thrombosis and embolism. His mortality from these unavoidable accidents in 1923 was 1.6 per cent; in 1930, 8.6 per cent; in 1931, 6.5 per cent. General poor condition causes 9 to 14 per cent of deaths as for instance the cachexia seen in carcinoma of the stomach. In addition, deaths are due to infection, especially peritoneal, mistakes in diagnosis or wrong indications. At least 1 per cent of deaths are due to cerebral hemorrhages and some remain undetermined even at autopsy.

A large amount of space is devoted to the preoperative evaluation of the risk in which constitution, age (both young and old), intercurrent physiological conditions such as menstruation and pregnancy, diseases including Basedow, Addison's disease, thymolymphatic status, etc., play a considerable rôle. Certainly in selected cases, functional heart tests, careful examinations of the lung, determination of the liver function, of kidney function, of blood disturbances, and changes in the basal metabolism must be thoroughly considered.

Dangers incident to the operation itself and immediate sequelae are next taken up, including the selection of the anesthetic, immediate preoperative preparation, care to be taken against leaving foreign bodies in the wound. Even such apparently minor matters as the avoidance of injury in giving injections either subcutaneously or intravenously, are discussed in detail. The avoidance of operative shock and collapse, as well as their treatment are fully discussed. Deaths on the operating table, air embolism, intracardiac injections and cardiac massage are described.

The next division concerns itself with after-treatment. The author believes in carefully graduated but sufficient morphine injections postoperatively. He then takes up such matters as loss of fluids, feeding, movement of the bowels, the

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<sup>s</sup>*Vorbeugung und Bekämpfung der Operationsgefahren.* Von Prof. Dr. M. Kappis Georg Thieme, Leipzig, 1933.



avoidance and treatment of cardiac, pulmonary and other complications as well as alkalosis, tetany, singultus, parotitis, psychoses, etc. A concluding portion of this division deals with the after-treatment of special areas after operations on the head, face, thorax, breasts, abdomen, etc. This book of over 375 pages contains a fund of information, impartially and clearly expressed.

R. T. FRANK.

Referring to the fact that the majority of gynecological patients begin their careers, so to speak, in the office of a private practitioner and that many of them must eventually be treated by special apparatus or handled with an unusual degree of skill by the gynecologist, Küstner<sup>9</sup> feels that the most important division of gynecology is early and exact diagnosis. In obstetrics, as well, he regards pre-knowledge of abnormalities, possible complications and early recognition of pathological conditions a *sine qua non*. To this end he has compiled in table form the diagnostic points in a series of gynecological and obstetrical conditions. These tables are supplemented for the most part by beautifully colored plates or very capably executed black and white drawings correlating the tables.

For gynecology he has arranged thirty-six tables beginning with malformations and congenital deformities of the urogenital system, continuing through inflammations, tumors, displacements, diseases of the tubes and ovaries, peritonitis, fistulas and gonorrhea. The tables vary in length and breadth as to the number of conditions which may affect a certain part. Symptomatology, etiology, pathology, bacteriology, clinical course, differential diagnosis, prognosis and changes in function are given.

Obstetrics begins with diagnosis, continues through abortion, and positions of presentation. Four charts on the toxemias, complications of labor, puerperal sepsis and diseases and injuries of the newborn are included.

Such a manner of presentation, stripped of nonessentials, will give to the practitioner a quick and striking picture to assist him in making an early and exact diagnosis.

PHILIP F. WILLIAMS.

The fifth edition of v. Jaschke and Pankow's *Lehrbuch der Gynäkologie*<sup>10</sup> is a large volume of 759 pages, costing 40 marks. Nine years have elapsed since the last edition was published. The two authors represent a continuation of the clinics of v. Rosthorn and of Krönig. The book is designed mainly for the student and practitioner. Debatable subjects and subjects of special interest to the specialist are not emphasized. Consequently operative technic is only dealt with in a most summary fashion. On the other hand, the connection between gynecology and general medicine is emphasized throughout.

General gynecology is dealt with in 262 pages, while the pathology and therapy occupies 460 pages of the volume.

The anatomy is short but good. The same may be said of the embryology and physiology. Next the hygiene of the female and woman as a patient, are discussed.

The treatment of functional and allied conditions by means of hormone therapy is, to say the least, over-enthusiastic and uncritical.

The second portion of the book is well written, informative, but rather difficult to read as it is too ample for the student and too general for the specialist. In

<sup>9</sup>Gynäkologische und Geburtshilfliche Diagnostik in Tabellenform. Von Professor Dr. Heinz Küstner. 65 Tabellen mit 72 farbigen und schwarzen Abbildungen. J. F. Lehmann, München, 1932.

<sup>10</sup>Lehrbuch der Gynäkologie. Von Dr. Rud. Th. v. Jaschke und Dr. O. Pankow. Fünfte Auflage. Verlag von Julius Springer, Berlin, 1933.

discussing diathermia, hydrotherapy and radiotherapy, so many details are included that it must be bewildering to the beginner.

The illustrations are especially good, well selected and well executed. Considerable literature in the form of footnotes adds value to the book although in the vast majority of cases only the German literature has been taken into account.

R. T. FRANK.

## OBSTETRICS

*Ten Years of Obstetrics and Gynecology in Private Practice*<sup>11</sup> has been offered largely to furnish a series of private cases for comparison with hospital statistics. The statistical summaries will undoubtedly be useful in such comparative deductions.

The text is divided into two parts, obstetrics, regarding 1750 cases, and gynecology, discussing 1345 cases with 1783 diagnoses. This material has been arranged in groups with figures, comments and in some instances, for the purpose of illustration, detailed case histories.

As all scientific and controversial matter is omitted, the book will be found entirely clinical and eminently practical. The reduction of complications as noted in the first chapter stresses the importance of good prenatal care. Simple measures sufficed for most vomiting of pregnancy cases, but one therapeutic abortion was done. Grave vomiting in advanced pregnancy with toxic degeneration of the liver is well discussed, and a characteristic history appended. The Voorhees' bag for lateral, and cesarean section for central placenta previa are recommended. No mention is made of transfusion or of packing after delivery in placenta previa or in premature separation of the placenta, although the author mentions (p. 21) that postpartum hemorrhage is a frequent and dreaded complication in the latter. Transfusion appears in the index but by a typographical error evidently refers to a wrong page.

The author treats his toxemias conservatively and is prompt in terminating pregnancy in the presence of a threatening eclampsia. Cardiac complications are very briefly discussed. There is no mention of the Wassermann reaction in the cases of unusual edema of the fetus and placenta. Decomposition and extraction of frank breeches is done at once on full dilatation. The author discusses the relative merits of episiotomy and of "ironing out the perineum" and is preferring the former. Medical induction was found useless and rupture of the membranes and insertion of a No. 4 Voorhees' bag routinely practiced. A delivery table with elevator lower section, and roller top section is described and illustrated. The old-fashioned stirrups are seemingly used in operative deliveries. Discussing analgesia and anesthesia the author believes the danger of morphine to the newborn is overrated. Perineal repairs are performed under infiltration anesthesia, novocain.

There were 431 instrumental deliveries in the 1750 cases. The modern tendency toward earlier interference is supported. Low or Simpson forceps were used 207 times, axis traction in 29, and Kielland in 195 cases. The author is enthusiastic over the Kielland forceps and devotes six pages to their use. In contrast podalic version receives a scant page. The vectis is resurrected. Ninety-five cesarean

<sup>11</sup>*Ten Years of Obstetrics and Gynecology in Private Practice.* A clinical report of 1750 obstetrical and 1345 gynecological cases, with comparative analyses of many of the larger groups, and detailed case histories of some of the more important and less common conditions. By John L. Rothrock, A.B., M.D., F.A.C.S. Formerly Associate Professor of Obstetrics and Gynecology, University of Minnesota; Former Member of the Miller Clinic and Chief of the Obstetrical and Gynecological Services of The Charles T. Miller Hospital. Pages 204, and 9 Illustrations. Paul B. Hoeber Inc., New York, 1933.

sections were performed in the series. In 10 per cent the indication was relative. In 44 cases the extraperitoneal operation was done, almost evenly divided between elective and emergency. The morbidity rate was unusually low and there were but five maternal deaths in the series. Consideration of the fetus concludes the obstetric section. The author makes the observation that private patient babies average heavier than ward service babies.

The second part of the book deals with private gynecology over the same ten years. The author stresses the importance of sufficient preoperative treatment of the cervical infections before any plastic work is undertaken. Prophylactically radium is used at the time of the diagnostic curettage. The ovarian function is always conserved when possible. The rôle of the appendix in the etiology of right sided pelvic inflammation is discussed. A modification of the Alexander operation for retrodisplacement of the uterus is practiced. The abdomen is always opened during the operation. Only two endometriomas of the ovary were encountered. Contrary to some authorities, curettage of the uterus, when a cervical polyp is removed, is advised against. The author noted but little change in the type of menopause whether ovaries are conserved or are removed in hysterectomy for fibroids. Radiation followed by radical operation where possible is practiced in carcinoma of the cervix. Two recurrences after a five-year cure are noted, as well as the occurrence of a second primary carcinoma eight years after the removal of the first. Under some miscellaneous case reports is recorded a recovery from tetanus following a vaginal hysterectomy, 335,000 units of antitoxin were used. There was an operative mortality of 0.38 per cent in 1268 patients.

Written with a very personal touch in the maturity of a professional life the book reflects the experience and judgment gained in years of trials and experiment, and emphasizes the methods and operative procedures which the author has found of proved value, as shown by his admirable results.

PHILIP F. WILLIAMS.

Thoms has written a fascinating brochure entitled *Chapters in American Obstetrics*.<sup>12</sup> He describes the early American midwifery in a most vivid fashion. Then he takes up the first obstetrics published in America by Samuel Bard, 1807. The introduction of ergot into obstetrics by John Stearns, under the name of "pulvis parturiens," is of interest. Among other well-known figures, William Potts Dewees and Oliver Wendell Holmes are pictured. A chapter on cephalic version introduced by M. B. Wright and in conclusion the introduction of ether in childbirth by Walter Channing, are given.

Thoms has succeeded in putting life and color into these historical sketches to a degree which should induce even readers not particularly interested in medical history to read these pages with pleasure, profit, and a feeling of pride for what the early American obstetricians have done.

R. T. FRANK.

The usual comparative studies in Embryology and Cytology have been discarded by Lucien and Vermelin in their *Treatise on the Human Ovum*.<sup>13</sup>

The first part of the book is devoted to Spermatogenesis and oögenesis from the origin of the germinal gland in the embryo to the fully matured adult cells

<sup>12</sup>Chapters in American Obstetrics. By Herbert Thoms. C. C. Thomas, Springfield, 1933.

<sup>13</sup>L'Oeuf Humain et ses Annexes Par Maurice Lucien. Professeur d'anatomie et Henri Vermelin, Professeur agrégé d'obstétrique à la Faculté de Médecine de Nancy. Preface du Professeur Couvelaire, Membre de l'Académie de Médecine. Pages 154; and Avec 78 figures. G. Doin & Cie, Paris, 1933.

capable of union. A note on sterility makes practical use of their observations. There is a full exposition of the sexual cycle completely in accord with the most recent anatomical and physiological researches, references to which are frequent. The rhythmic cycle of the fallopian tube, shedding of cilia, granulation of cells, and hemorrhage following closely the uterine cycle is described, as is also the vaginal cycle.

The physiology of nidation, its variants, including multiple pregnancy and the associated phenomena are discussed. The manner and time of development of the appendages, membranes and placenta and the physiological significance, for the embryo, from a nutritional aspect are given fully. The very early human ova and embryos reported in the literature since Peter's ovum are listed and classified as to development. The final chapter takes up the circulatory mechanism.

This assembly of facts, by an anatomist and an obstetrician, is a good basic statement of the present status of human embryology, and will make an excellent reference book.

PHILIP F. WILLIAMS.

De Lee's *Obstetrics*<sup>14</sup> continues to be one of the outstanding contributions on this subject in the English language. Since 1913, it has gone through six editions, each with careful changes to keep it up to the present state of our knowledge, and a number of reprintings in addition.

This new edition is a volume of 1165 pages and contains many changes as well as a number of new illustrations. De Lee has more and more taken cognizance of two methods of delivery, the one, strictly hospital in the hands of specialists, and most often applied to the abnormal cases; the other, in the hands of the general practitioner where delivery is performed in the home, which requires an entirely different viewpoint and much more noninterference.

De Lee divides eclampsia into true toxemia, acute nephritis, chronic nephritis and malignant hypertension. As the cause of this symptom complex is unknown, his classification is as acceptable as any other. He believes in allowing the patient to deliver herself.

A careful review of borderline conditions, involving problems of internal medicine, has been performed, including tuberculosis, diabetes, heart disease and syphilis.

The frequent use of illustrations based on motion picture films is employed. These would be more useful if the pictures were larger.

The literature has been kept up to date.

As heretofore, this volume is of great value both to the practitioner and obstetrician because of the immense experience recorded in its pages as well as the meticulous care employed in constant revisions.

R. T. FRANK.

This medium-sized volume on *Practical Obstetrics*<sup>15</sup> admirably fulfills the aim of the author to produce a text midway between a complete reference book and a compendium. Stripped of any unnecessary verbiage and omitting all scientific discussion, the present-day ideas and practice are given, concisely and succinctly, in well-spaced chapters, with plenty of excellent illustrations. It is a suitable book for the student days or the years of early practice, and has a simplicity of presentation

<sup>14</sup>*The Principles and Practice of Obstetrics.* By Joseph B. De Lee. Ed. 6, W. B. Saunders Co., Philadelphia, 1933.

<sup>15</sup>*Lehrbuch der Praktischen Geburtshilfe für Studierende und Ärzte.* Von Prof. Dr. Sigfrid Hammerschlag, Direktor der Brandenburgischen Landesfrauenklinik in Berlin-Neukölln. Seite 290: mit 101 teils farbigen Abbildungen. Ferdinand Enke, Stuttgart, 1933.

similar to some recent American manuals and introductions. There is little to criticize in the text and the conservative practice recommended should meet with much approval.

PHILIP F. WILLIAMS.

The obstetric conditions in the tropics which are materially different from those of the West in respect to anatomy, climate, and diet are described in this book by Green-Armytage dealing with *Midwifery in the Tropics*.<sup>16</sup> It has been written not only for the Indian student but for the medical man, with a western education, beginning practice in eastern or tropical countries. The subject matter follows the usual divisions of the average textbook, and is presented in a crisp, staccato style, a concise form to help students to whom English is indeed a foreign language.

Among the racial differences it is noted that the head of the oriental fetus measures a quarter of an inch less in all important diameters, than the European fetus; that the generally contracted, round inlet, pelvis is quite common in India and the funnel pelvis is very common. As osteomalacia and rickets are frequent diseases in India all varieties of contracted pelvis are often seen.

The average maternal mortality is 4 per cent, and complications occur in 20 per cent of the cases. Lack of prenatal care is practically universal in India; the authors supply excellent rules for antenatal and postnatal care, the chapter on the latter is especially good. A dietary for Europeans resident in India is listed as well as one for natives. This has been drawn up with a view to lessening the many complications which may be referred to dietary deficiencies. The authors are conservative in their treatment of toxemias. They refer to an unusual frequency of pelvic abscess following ectopic pregnancy, whether operated upon or not.

Among the tropical conditions quite fully discussed are the anemias of pregnancy, frequent and severe, and a cause of much morbidity and mortality, malaria, kala-azar, tetany, dysentery, osteomalacia in its various stages. They find morbid changes occur quite early in multiparas, a para iv often being a greater problem than in her first pregnancy and delivery, all due to tropical habits and diseases. Fifty per cent of puerperal pyrexias are due to tropical disease, and at times the differential diagnosis of sepsis is difficult. Cesarean section occurs once in every forty cases in the Eden Hospital. The authors state that, having given the Kielland forceps an extended trial they do not recommend it.

The few illustrations used demonstrate cephalopelvic disproportion. A graphic chart is used to bring out all the points of antenatal care. The book is a very good manual on obstetrics, and is interesting in its portrayal of the manifold difficulties under which obstetrics is practiced in India.

PHILIP F. WILLIAMS.

A most interesting subject was taken up by the Ukrainian Congress of Obstetrics and Gynecology at Kiew, dealing with the experience resulting from the *Liberalization of Inducing Abortion in the Soviet Republic*.<sup>17</sup> The subject has been considered of such interest that the German *Gesellschaft für Gebrutshilfe und Gynäkologie* instructed Professor A. Mayer of Tübingen to supervise the trans-

<sup>16</sup>A *Textbook of Midwifery in the Tropics*. By V. B. Green-Armytage, M.D., F.R.C.P. (Lond.), F.C.O.G., Lt.-Col., I.M.S., Chevalier of the Legion of Honour; Order of the White Eagle of Serbia; Professor of Midwifery and Gynecology, Calcutta Medical College, and Surgeon to the Eden Hospital for Women, Calcutta, and P. C. Dutta, M.B., F.R.C.S., D.G.O., Captain I.M.S. Pp. 282: 7 Illustrations and 1 Chart. The Book Company, Ltd., Calcutta, 1933.

<sup>17</sup>Erfahrungen mit der Freigabe der Schwangerschaftsunterbrechung in der Sowjet-Republik. Herausgegeben von Professor Dr. A. Mayer, Universitäts-Frauenklinik in Tübingen. Verlag von Ferdinand Enke, Stuttgart, 1933.

lation and bring out this study in the form of a monograph which appeared as a supplement to the *Zeitschrift für Geburtshilfe und Gynäkologie* (Volume 104).

The Ukrainian Congress met in 1927. The report contains many independent papers which deal with the social indications for induction of abortion, the limitation of abortion to the first three months of pregnancy, the reasons for inducing abortion. The main indication appears to be economic stress which in most instances has been determined by a Commission.

At first, certain hospitals were indicated as "Abortaria" but later, when the bed capacity was found insufficient, private clinics were permitted to accept patients for this purpose. There has been a steady increase in induced abortions since 1913. Of the patients seeking abortion, there is some difference in different committees, but in general up to 80 per cent of them are married.

In consequence of the liberalization, charlatans and lay abortionists have greatly decreased. In spite of the diminution of clandestine abortions and the fact that the procedure is entirely in the hands of the medical profession, the medical dangers appear to be ever present, including infection, injuries, and many others.

From 1922 to 1926 the number of all abortions rose from 53 to 80 per cent of births in the city of Moscow. This percentage included likewise an increase of induced abortions from 12 to 26½ per cent. The various technics which apparently are far from being standardized were discussed by different speakers. Some stress was laid on contraception as a proper means of limiting the necessity of abortion. As yet, no political or economic change in the incidence of population has been noted.

The Congress adopted resolutions in which it noted that there was an increase in the number of induced abortions both in the cities and in the villages; that there was a marked decrease in clandestine abortions with a definite decrease in morbidity and mortality; as yet no decrease in the number of the population has been shown; that the medical dangers had not decreased.

Hence the procedure should be limited to hospitals and trained medical men, and that because of the dangers in inducing abortion, the use of contraceptives is greatly favored.

R. T. FRANK.

*The Law Against Abortion*<sup>18</sup> by William J. Robinson is frankly propaganda. No one who knows the life of the author can doubt his bona fides and yet some of its contents is, to say the least, startling. The whole basis of the book, as stated in the first chapter, is the demand for complete and total abrogation of any law against abortion. Robinson is strongly in favor of contraception or prevention, as he calls it. He acknowledges that abortion is an evil, but a necessary one.

This tract is cleverly written in flamboyant style but contains many well worth-while truths. The point of view and overemphasis will startle and antagonize many readers.

R. T. FRANK.

Briquet's *Operative Obstetrics*<sup>19</sup> should be exceedingly valuable to those interested in obstetrics, if only for its beautiful format and illustrations. Although the author's

<sup>18</sup>The Law Against Abortion. Its Perniciousness Demonstrated and Its Repeal Demanded. By William J. Robinson. The Eugenics Publishing Co., Inc., New York, 1933.

<sup>19</sup>Paul Briquet: *Obstetricia Operatoria*. (Portuguese.) First and Second Editions. Companhia Editora Nacional, 1932, Sao Paulo, Brazil.

views may not be universally acceptable, the clearness of presentation as well as the soundness evidenced in the handling of commoner obstetrical procedures should more than make up for its deficiencies. Among the latter may be mentioned a relatively small bibliography which limits discussion of various questionable maneuvers considerably. The chapter on anesthesia consists largely of a discussion of anesthesia by the spinal route with many pages devoted to the technique. Anesthesia à la reine and local analgesia are touched upon but there is no mention of Gwathmey, avertin, pernocton, sodium amytal, or even morphine. Laudable chapters on the handling of postoperative complications as well as the newer metabolic concepts are appended. The book is greatly in need of proof reading and correction, a defect which will doubtlessly be rectified in subsequent editions.

FRANK SPIELMAN.

Only the very common obstetrical procedures are discussed in this relatively short book on *Obstetrical Operations*.<sup>20</sup> Almost half of it is devoted to a consideration of forceps alone and the discussion of the different types with their indications is gone into at considerable length. It is interesting to see the great variety of instruments still in use. The author in one of his illustrations shows 44 different models, and to these many more might be added. With the emphasis placed on forceps, there is little room for other subjects. Version, embryotomy, symphysiotomy, cesarean section, and hysterectomy are the only other procedures covered, and although the bibliography is extensive the discussion is limited. The illustrations could be greatly improved. The value of this book, in the main, lies in its thorough consideration of the use of forceps.

FRANK SPIELMAN.

This small *Manual on Prenatal Care*<sup>21</sup> is evidently filling its niche, as the first edition was reviewed only two years ago. In this revision a description of the Aschheim-Zondek test for pregnancy is added and its use is further mentioned under missed abortion and chorionepithelioma. A chapter has been added on postnatal care which is timely, as such attention truly complements prenatal care. A good outline is given on the various conditions which may be met with; the examination and treatment of minor ailments is discussed. Long continued postnatal care of toxemic and other complicated cases is highly recommended. No mention is made of contraceptive advice.

Of interest is a short section on Maternity and National Health Insurance Benefits. In England the Factory Act prohibits a woman from working for four weeks after delivery, but nothing prevents her from working up to the actual day of her confinement.

The further additions and revisions in the text serve to keep the book an excellent guide in caring for the pregnant woman.

PHILIP F. WILLIAMS.

<sup>20</sup>*Manobras e Operaciones Obstetricas*. Perciro de Camargo, J. (Portuguese.) Imprensa Nacional, Rio de Janeiro, Brazil, 1932.

<sup>21</sup>*Antenatal Care Including the Abnormalities Associated With Pregnancy and a Section on Postnatal Care*. By W. F. T. Haultain O.B.E., M.C., B.A., M.B. (Camb.), F.R.C.S.E., M.R.C.P.E., M.C.O.G. Senior Assistant Obstetric Physician and late Special Assistant to Ante-Natal Department, Edinburgh Royal Maternity Hospital and E. Chalmers Fahmy, M.B. (Edin.), F.R.C.S.E., M.R.C.P.E., M.C.O.G., Assistant Obstetric Physician and Special Assistant to Ante-Natal Department Edinburgh Royal Maternity Hospital, with foreword by Professor R. W. Johnstone C.B.E., M.A., F.R.C.S.E., F.C.O.G., M.R.C.P.E. Professor of Midwifery and Diseases of Women, University of Edinburgh. Second Edition. Pp. 121: 3 Illustrations and 5 Charts. New York, William Wood and Company, 1931.

Corkill's work on *Midwifery and Infant Care*<sup>22</sup> is based on lectures to midwives and graduate nurses which the author has given for a number of years, and is offered as a working manual for handling obstetrical cases alone or as an assistant to a physician. The primary aim of the book has been to elaborate the rules and regulations of the New Zealand Department of Health, and the Midwives' Registration Board, for the purpose of reducing the dangers of infection during labor and the puerperium. An aseptic technique has been standardized throughout the hospitals of New Zealand by the Department of Health. This standard is presented and reasons given for every step recommended. As a matter of note, puerperal sepsis is no longer the chief cause of maternal mortality in that Dominion.

The plain and simple language of the book and the full explanations should make it a very good manual for the preclinical obstetrical course for a medical student. Practical demonstrations in minor laboratory work and antenatal care are given for the benefit of the midwives who evidently constitute a group entirely dissimilar from our conception of midwives. Chloroform seems to be the anesthetic choice in New Zealand. Rickets is rarely seen.

Several chapters are devoted to the infant, emphasis being placed on breast feeding, but with full details for artificial feeding. The end of each chapter has a concise summary, with rules of responsibility to the patient and the physician.

The author states that under certain circumstances in placenta previa the midwife may rupture the membranes or even insert a vaginal pack. To avoid unnecessary consultation calls by the midwife the author has devoted considerable space in explaining the various causes of delay in labor.

Throughout the book the emphasis is laid on the prevention of sepsis and an appendix is devoted to the Department of Health rules for disinfecting of rooms and equipment used in infected cases.

The caliber of the instruction seems unusually complete for midwives and graduate nurses until one realizes that for the most part these are women of unusual training and must carry on many complicated labors alone.

PHILIP F. WILLIAMS.

The tenth edition of De Lee's *Obstetrics for Nurses*<sup>23</sup> has been brought up to date. Besides the general nurse, it aims to teach the advanced nurse and teacher of nurses as well as the pupil nurses themselves.

Particular notice is given to obstetrics in the home as more than 50 per cent of all deliveries occur outside of hospitals.

The book is a very well-balanced description of obstetrics for nurses and shows the known qualities of De Lee as a teacher and experienced clinician.

R. T. FRANK.

This volume of almost 500 pages contains the chairman's report and the following 22 studies, mostly in monographic form, of *Factors and Causes of Fetal, New-born, and Maternal Morbidity and Mortality*.<sup>24</sup> Acute Infectious Diseases in Pregnancy, Labor and the Puerperium by Dr. J. P. Greenhill of Chicago; Syphilis and

<sup>22</sup>Lectures on Midwifery and Infant Care. A New Zealand Course. A practical manual on management of pregnancy and labour and the care of the infant, conforming with the syllabus laid down by the Nurses and Midwives' Registration Board of New Zealand. By T. F. Corkill, M.C., M.D., M.R.C.P. (Ed.), Lecturer to Nurses and Midwives' Registration Board of New Zealand; Senior Honorary Physician, Wellington Children's Hospital; Honorary Physician to Truby King-Karitane Hospital, Wellington; Member of the New Zealand Obstetrical Society. Pp. 410. Coulls Somerville Wilkie, Ltd., Auckland, New Zealand, 1932.

<sup>23</sup>Obstetrics for Nurses. By Joseph B. De Lee. Ed. 10, Thoroughly Revised. W. B. Saunders Co., Philadelphia, 1933.

<sup>24</sup>Fetal, New-born, and Maternal Morbidity and Mortality. Report of Sub-Committee 4 of Section I, B of the White House Conference on Child Health and Protection. Hugo Ehrenfest, M.D., Chairman. D. Appleton-Century Company, New York, 1933.



Pregnancy by James Robert McCord of Atlanta; Pulmonary Tuberculosis in Pregnancy by Dr. Otto H. Schwarz of St. Louis; Parasitic Infections Complicating Pregnancy by Dr. Ernest Carroll Faust and Dr. Edward Lacy King of New Orleans; Heart Disease and Pregnancy by Dr. William W. Herriek of New York City; Nephritis Complicating Pregnancy by Dr. John W. Harris of Madison; Toxemia Problem by Dr. George W. Kosmak of New York City; Diseases of the Teeth and Gums in Pregnancy by George H. Wandel, D.D.S., of Chicago; Uterine Cancer and Pregnancy by Dr. John A. McGlinn of Philadelphia; Diseases of Endocrines and of Blood Complicating Pregnancy by Dr. Robert D. Mussey of The Mayo Clinic, Rochester; Induction of Labor With Special Consideration of Artificial Rupture of Membranes by Dr. Alan F. Guttmacher of Baltimore; Forceps and Cesarean Section by Dr. E. D. Plass of Iowa City; Anesthesia and Pain Relief in Obstetrics by Dr. Carl H. Davis of Milwaukee in cooperation with Drs. A. B. Bill, John W. Harris, Arno B. Luckhardt and Ralph M. Waters; Fever in the Puerperium by Dr. W. E. Caldwell of New York City; Non-Febrile Complications of the Puerperium by Dr. William C. Danforth of Evanston; Proper Postpartum Care by Dr. Charles Edwin Galloway of Evanston; Influence of Maternal Pelvic Therapeutic Irradiation on the Health of the Subsequent Child by Dr. Douglas P. Murphy of Philadelphia; Fetal Mortality in Breech Presentations by Dr. William Emery Studdiford of New York City; Relation of Birth Trauma to Neonatal Mortality and Infant Morbidity by Dr. Hugo Ehrenfest of St. Louis; Immediate Care of the Newborn by Dr. Joseph L. Baer of Chicago; The Importance of Complete and Accurate Certificates of Birth and Death in the Prevention of Maternal and Early Infant Mortality by Dr. Richard A. Bolt of Cleveland; Abortion in Relation to Fetal and Maternal Welfare by Dr. Fred J. Taussig of St. Louis.

In fairly systematic form for all the more common diseases found in pregnant women, the effect of pregnancy on the usual course of the disease is discussed, and as well the influence of the disease on the course of pregnancy and on the fetus in utero. The problems of prevention and of interruption of pregnancy in the interest of the mother are discussed in detail with due consideration of special methods of delivery required under certain conditions.

This full list of articles contained in the volume and of the competent men contributing them, better than any detailed description of their rich contents, will furnish an adequate idea concerning the immense practical value of this book for the obstetrician and especially for every practitioner doing obstetric work.

GROVER LIESE.

This exhaustive *Study of the Female Pelvis*<sup>25</sup> covers the subject from every possible angle. The scientific side of the problem has not been permitted to overshadow the practical aspect and a full clinical consideration is presented, with the author's ideas often elucidated by appropriate case histories. The book is profusely illustrated. There are many photographs showing the clinical application of the directions prescribed for pelvimetry and cephalometry, and a number of clear and distinct roentgenograms.

The historical review portrays in a sense the history of obstetrics. The racial differences shown in the widely gathered ethnological studies have a practical importance in our international population trend. One can agree with the author that the average native white female pelvis in private practice is smaller than the standard set by the American Committee. The far-reaching influences in

<sup>25</sup>The Pelvis in Obstetrics. A Practical Manual of Pelvimetry and Cephalometry Including Chapters on Roentgenology. By Julius Jarcho, M.D., F.A.C.S., Consulting Gynecologist, Hastings 1st St., New York, and Obstetrician and Gynecologist, Sydenham Hospital. Page 312, 51 Tables. Paul B. Hoeber, Inc., New York, 1933.

the development of the abnormal pelvis are well presented; in these the effects of modern civilization and its corrolaries have had their part.

The classifications enumerated are based upon changes in form, etiology, and degree of deformity. Each is discussed with explanatory remarks. The author notes several varieties of the funnel pelvis, a deformity which has been well studied by American obstetricians.

Methods of external and internal pelvimetry are considered from the standpoint of their practical application. The various instruments suggested are pictured and their use described. The author feels that simple methods, intelligently employed, give just as valuable information as some of the complicated devices recommended. The diagnosis of cephalopelvic disproportion, which is the crux of the whole problem, is the subject of a very able chapter. The author favors elective cesarean section in most borderline cases. Those uncertain of obstetric diagnosis may study this chapter with profit.

The book concludes with chapters on roentgenographic pelvimetry and cephalometry. He discusses his own method of calculation, as well as the use of the Thoms' grid, and states various obstetric indications for use of roentgenologic studies. It would be quite surprising to learn that any reference to the pelvis in the world's literature has been overlooked, for there is appended to the text a bibliography of twenty-seven pages. Possibly the only criticism of such an outstanding collection of references might be that it was not classified into groups referable to the subdivisions of the text.

This book is such a splendid work of reference and of practical detail that it will be found of value to anyone teaching or practicing obstetrics.

PHILIP F. WILLIAMS.

#### RADIOLOGY AND RADIOTHERAPY

In the foreword of Lüttge's monograph on *Forceps Operation in Röntgen Picture*<sup>26</sup> Wintz outlines the advances in roentgenology, during the past fifteen years, and remarks upon its application to obstetrics; the diagnosis of pregnancy, pelvimetry, cephalometry, disproportion, birth mechanism and forceps delivery.

Lüttge in the text reviews the history and methods of obstetrical roentgenology. A broadening of the indications for forceps extraction, and the prerequisites, are described. He discusses mensuration of the pelvis, the effect of altered positions of symphysis upon the inlet and the relationship of the abnormal inlet upon the mechanism. In the chapter on the mechanics of forceps delivery he brings out the differences in the mechanics of birth when pressure is made from above and when traction is made from below, particularly in regard to the rotation of the head and the attitude of the child during the contractions of the uterus and traction on the forceps and the rotation of the various parts of the vertebral column. He shows the deviations in birth mechanism from normal in forceps deliveries, particularly with reference to the theory of Sellheim and the observations of Warnekros.

The indications and the limitations of forceps in hospital and home practice are outlined in table form.

Thirty-four roentgenograms portray clearly and accurately serial pictures of births, rotation of the head in spontaneous delivery and with forceps extraction. His conclusions seem amply substantiated on careful study and comparison of the serial pictures.

PHILIP F. WILLIAMS.

<sup>26</sup>Zangengeburt im Röntgenbild. Von Dr. Werner Lüttge. Privatdozent für Geburtshilfe, Gynäkologie und Röntgenologie, Oberarzt an der Universitäts-Frauenklinik in Erlangen. Mit 7 Abbildungen und einem Atlas von 34 Kunstdrucktafeln. Ernst Reinhardt, München, 1933.

Simon's monograph on *Curie-Roentgen Therapy in Malignancies of the Female*<sup>27</sup> is the twentieth in the series of "Radiologische Praktika" which is edited by the outstanding radiologists and physicists in Germany and Austria. The title "Curie Therapie," in honor of the discoverer of radium, refers to all types of radium therapy rather than to the methods used at the Curie Institute in Paris. The volume was designed, as the author states in the introduction, for the use of those who have a practical working knowledge of gynecological radiology. He warns the novice of the dangers of radiation and emphasizes the fact that every patient with a malignancy is a law unto herself. For this reason he stresses the importance of special training in Radiology for those who intend to employ physical agents in the treatment of malignancies of the female genital tract.

The volume is divided into two parts. The first part deals with the biophysical factors underlying Radiation Therapy. The second half treats of the various malignancies of the vulva, vagina, cervix, fundus and ovaries. A brief review of the natural history and pathology of the different entities is given. The indications and contraindications and the results of radiation treatment are also discussed. In addition there is a brief review of various radiation methods that are used in the outstanding gynecological clinics on the continent.

The important rôle of Roentgen Therapy as an adjuvant to radium therapy is stressed throughout the volume. The methods that are used by the author resemble those generally employed in the best clinics both here and abroad. There are numerous illustrations of special applicators for radium therapy which the author has designed. The book is well printed and illustrated. It should be of value to anyone who wishes to have under one cover a résumé of the various methods used in gynecological radiation therapy.

WILLIAM HARRIS.

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<sup>27</sup>Die Curie-Roentgentherapie bösartiger Frauenleiden. By Dr. Stefan Simon. Georg Thieme, Leipzig, pp. 122, 1933.

(To be continued.)

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## Item

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### American Board of Obstetrics and Gynecology

The next written examination and review of case histories for certification by the American Board of Obstetrics and Gynecology will be held, according to location of applicants, in various cities of the United States and Canada, on Saturday, December 9, 1933, at 2 P.M. For application blanks and further details, address, Paul Titus, M.D., Secretary, 1015 Highland Building, Pittsburgh, Pennsylvania.

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## Original Communications

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### EVALUATION OF RADIATION THERAPY IN MALIGNANT DISEASE OF THE FEMALE GENERATIVE TRACT\*

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*(From the Memorial Hospital)*

DR. WILLIAM H. WELCH in his introductory remarks for the Ewing Cancer volume said, "Cancer is today the outstanding problem in medicine and public health; that it threatens the ascendancy of all other causes of death; that its study engages the attention of workers in all fields of medicine and surgery; and that education both of the medical profession and the public is the most essential part of the campaign for the prevention and cure of cancer."

Tumors, especially malignant tumors, represent a very important part of the work of the specialist in the diseases of women. Much has been written regarding the etiology, symptomatology and treatment of these tumors.

We will limit our discussion at this time to a consideration of the more common cancerous diseases of the female pelvic structures and in particular will consider the part which radiation therapy plays in this field.

We will use the phrase radiation therapy as applied to the treatment of malignant disease in the female pelvis to indicate, unless otherwise specified, the use of combined radiation with radium applied at the site of the lesion, when feasible, and external radiation with x-ray, except in occasional instances in which a radium element pack may be available. It is really quite interesting in reviewing the literature to note how uniformly combined radiation is now used in the larger clinics of Europe and America.

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\*Read before the joint meeting of the New York, Philadelphia and Boston Obstetrical Societies, April, 1932.

Carcinoma of the cervix and carcinoma of the vagina seem to have been almost entirely removed from the domain of surgery and to have become problems for radiation alone. As far as the disease of the vaginal tube is concerned operation seems to have no place. In carcinoma of the cervix, however, one still finds a small number of gynecologists of ability more especially in central Europe who continue to do radical hysterectomy in their most favorable cases but even in Germany under the influence of Professor A. Döderlein and his associates radiation therapy is gradually replacing surgery. It must be realized that radiation is a relatively new form of therapy and that the physical and biologic problems interwoven with it are not as yet fully understood. The response of tumors to treatment is not always what we expect, and there are unexpected variations in local tissue reactions, as well as in the constitutional reaction of the patient, not only to the treatment but to the disease.

We are from time to time sorely disappointed because an apparently early and favorable case fails to do well and on the other hand we are surprised and confused because some cases apparently far advanced, in which a good result is extremely doubtful, will respond unexpectedly well to radiation and become a five-year apparent cure.

The variations in radiation technic observed in different clinics of importance can only indicate to us that the detail of dosage, filtration, frequency of treatment, duration of time of application of radium, interval of time elapsing between treatments are still in a somewhat experimental stage and no hard and fast rule can be drawn regarding these details. To some extent as far as radium treatments are concerned the total milligram hours for a single dose, the duration of time of application of the radium, the interval between treatments and the number of treatments are influenced by the amount of radium available in the individual clinic. It may be said that when it is necessary to place radium in a cavity such as the cervix or corpus, or in a crater, there is a feeling that it should not remain longer than twenty-four hours without being removed. This is due to the fact that the bacterial content of these cancers consists largely of streptococci and the prolonged application of radium in a closed cavity surrounded by gauze packing, etc., has led to unpleasant complications from infection.

Aside from the question of detail of treatment, as indicated above, other important factors which influence the end-results are the age of the patient (the very young and the very old tend to do badly), the patient's general health as indicated by the degree of anemia present, the presence or absence of infection and, finally, the extent of the disease.

It is interesting to note that considerable attention is being paid to a study of cellular differentiation as indicated by variations in histologic structure.

There has been a feeling more or less prevalent that by classifying the primary lesions into different groups depending upon variations in histologic characteristics of the cancer cells and stroma, which permit tumors made up of so-called immature, anaplastic, or undifferentiated cells to be placed in one group and the fully developed, mature, adult cell type of tumor to be placed in another group with an intermediate group between these two representing tumors consisting of mixed varieties or proportions of cells resembling the first and third groups, that there might be found important differences either in response to treatment or in end-results in these histologic groups which would be helpful from the standpoint of prognosis and possibly in other ways.

It is known that tumors made up of immature, undifferentiated cells are usually the most malignant; they tend to form metastases quickly and to grow rapidly. The surgical prognosis in such cases is usually bad. It was felt that the cells of these tumors being less stable might respond well to radiation therapy and that their metastases might also be favorably influenced by such treatment thereby rendering the prognosis better under radiation therapy in this group of cases. To some extent this belief has been borne out by the investigations and reports of different writers but there has been no uniformity of result or conclusion, except possibly, the observation that in tumors consisting largely or wholly of malignant cells of the immature, undifferentiated, anaplastic type, the primary response to adequate irradiation is usually satisfactory and encouraging, but the duration of cure as indicated by five-year end-results does not on the whole seem to be much if any better in this group of tumors than it is in tumors made up of fully mature adult cells. This no doubt is due to metastases present at the time of treatment but located beyond the area of effective radiation and therefore not destroyed by it. My own impression as to the effect of radiation in the radiosensitive lesions of the anaplastic cell type, especially in the cervix, is that even when advanced, the primary lesion may be expected to respond well to treatment and give complete primary healing. However, such tumors being of high malignancy it must be realized that metastases have been no doubt disseminated early.

It is evident that the crux of the problem from the standpoint of favorable results or cure is the same in radiation therapy as in surgery and depends chiefly, so far as we are at present able to determine, upon the clinical stage of disease. The earlier the diagnosis and the smaller the lesion the better the prognosis.

*Vulva.*—Carcinoma of the vulva is to a large extent a single disease in which the tumor is made up of fully developed squamous epidermoid cells of the Grade 1 or Grade 2 radiation resistant type. It is known that such cells are not easily influenced to regress or disappear under radiation therapy with the application of less than five to ten

skin erythema doses. The disease is seldom seen except in women at or beyond the menopause, in whom the tissues of the vulva in most instances are already abnormal and are easily damaged.

In treating the disease, one must not only adequately irradiate the primary lesion, but must also endeavor by means of radiation to take care of the metastatic field as indicated by the lymphatic drainage area. Our experience in attempting this method of treatment for cancer of the vulva has indicated that the normal tissues of the vulva will not tolerate the necessary radiation dosage. It has resulted in prolonged and extensive ulceration and slough causing much destruction of normal tissues, great suffering and prostration to the patient and has, we believe, in many instances shortened the patient's life. Attempts have been made to carry out preoperative irradiation of the lesion with radium and of the groins with x-ray and, at a subsequent date, to do bilateral groin dissection and complete vulvectomy. Such attempts have been largely complicated by the damage resulting from radiation and have in many instances delayed or completely set aside the possibility of operation. At the Memorial Hospital we have done a fairly large number of complete vulvectomies with unilateral or bilateral groin dissection and have been very much impressed by the small number of instances in which the enlarged palpable glands were involved by cancer. In the vast majority of instances the glands were only inflammatory.

For some time now we have omitted radiation entirely in the treatment of the primary lesion in cancer of the vulva. The plan now followed consists of complete vulvectomy extending out to but not including the groins or the femoral regions. The groins are irradiated with a full dose of high voltage x-ray during convalescence from the operation and thereafter are closely observed, and if any suspicious nodes make their appearance, they are exposed under local anesthesia, and radon gold filtered seeds are placed in them for an amount equivalent to not less than five skin erythema doses to the area treated. By this procedure the primary lesion has been completely cured and the use of interstitial radiation in the inguinal nodes not only takes care of the node but also the surrounding gland bed. As we have been doing this procedure only about two years, it is difficult to say at this time what the final results will be. However, we can say that the plan is essentially the same as that followed in the treatment of cervical nodes from primary mouth lesions in which dissection of the nodes is avoided if possible and has seemed to give reasonably satisfactory results.

Taussig, as you know, does an extensive two stage operation consisting of vulvectomy and dissection of glands and has reported 81.8 per cent five-year cures in 11 operations without a fatality. His absolute cure rate by surgery in 76 cases was 26.5 per cent.

Of 8 cases on our service which have survived five to ten years since treatment, surgical removal of the vulva and dissection of one or both groins was the important procedure in each case. Radium played a very small part in the treatment of these cases and when used was in the form of radon seeds placed in the primary growth before vulvectomy.

*Vagina.*—Surgical treatment for the cure of vaginal cancer has rarely succeeded. The operative procedure is extensive and yet seldom sufficient to completely remove the disease. Radiation therapy has therefore supplanted surgery and the results on the whole are not discouraging when compared with the unsatisfactory results of surgery.

Carcinoma of the vagina is usually of the squamous epidermoid histologic type.

From the gross or morbid anatomy standpoint we have observed three varieties, (a) a soft, spongy, friable, extremely vascular lesion of the cauliflower variety which occurs chiefly in elderly women with senile vaginitis and often fills the vaginal tube but is slow to infiltrate the vaginal mucous membrane and underlying structures. Such patients often are prostrated by hemorrhage and seem quite ill but the lesion is easily destroyed by radiation therapy and the prognosis is good; (b) a circumscribed, firm, infiltrating lesion, most often in the rectovaginal septum but occasionally in a lateral wall. This lesion is seen in younger women and tends to ulcerate on the vaginal surface before involving the rectal mucosa. If this variety is seen reasonably early, the prognosis for cure of the local lesion is good with radiation therapy but lymphatic recurrences or metastases to regional glands usually make their appearance in the second year and the subsequent course of the disease may be rapid; (c) the third variety seems to surround the entire vaginal tube, especially the upper portion, creating a rigid, stenosed canal and is associated with much pelvic pain, dysuria, and rectal distress. The prognosis with any form of therapy in this variety is quite bad and one can only attempt palliation by means of external radiation with x-ray or radium pack. About 50 per cent of the cases of vaginal cancer die in the first eighteen months with or without treatment. We have had 99 cases at Memorial Hospital from January, 1918, to December 31, 1931. These patients have all been treated with radiation therapy alone, except in one or two cases where electrocoagulation was also used to reduce the tumor mass at the time the radium was applied. Twelve per cent have survived five years or more, 14 per cent for three years, and 26 per cent for two years. Some of these have already died, others are still going on.

Reports of 129 cases from the literature, published by Philipp and Gonick, Bumm, Schaefer, Heyman, Giesecke, Gal, de Buben, show



16 patients living five or more years, a cure rate of 12.4 per cent with radiation therapy consisting of radium with or without x-ray.

*Corpus.*—Carcinoma of the corpus has always been regarded as a disease to be treated by surgical removal of the uterus. However, in many instances it occurs in women of advanced years, poor in health and often suffering from arteriorenal damage, diabetes or greatly over weight, so that the risk of hysterectomy is so grave we have turned to radiation for help. Radiation consisting of radium within the uterine cavity and x-ray externally is here gradually creating a definite field for itself. A field which augurs much for the welfare of the patient and is a distinct help to the surgeon.

As a result of treating, with radiation, the cases in which surgery was contraindicated, we have learned that many, not only are relieved of their symptoms but have been cured for five or more years. Series of cases therefore are reported in the literature indicating that radiation therapy has a real field of usefulness in the treatment of properly selected cases of carcinoma of the corpus and that indeed one can be hopeful of obtaining a cure by this method in a large proportion of the cases especially if the disease is still confined to the uterus.

Burnam reports 55 per cent of operable cases living and well for five or more years, and if the patients known to have died from other causes than cancer are excluded the cure rate was 69 per cent. In the advanced inoperable cases of corpus cancer but without demonstrable metastases the cure rate was 12.9 per cent. The absolute cure rate in both groups was 32.7 per cent. Burnam concludes that "radiation offers a method of treatment for operable cancers of the body of the uterus comparable to the best surgical treatment in its permanent results and obviates, to a large measure, primary mortality." He believes that preoperative radiation does not increase the hazards of operation and that postoperative radiation would seem to be a logical procedure in many cases.

Heyman of Stockholm reports 50 per cent five-year cures in the operable cases of cancer of the corpus and 26.9 per cent of the inoperable cases free from recurrence for more than five years with radiation therapy alone.

He very strongly urges that hysterectomy for cancer of the body of the uterus should be followed by radiation treatment and says that the figures in this group of cases at Radium Hemmet show a five-year cure rate of 77.3 per cent as compared with 58.8 per cent which is the average result for operation alone.

de Buben of Budapest in a small series of cases reports 15.3 per cent absolute cure rate with radiation.

Herman Wintz reports 69.5 per cent five-year cures in a series from 1915 to 1925.

Such experiences have taught us that the opinion, largely prevalent, which regards cancer of the corpus as a radiation resistant lesion because it is glandular is not, in the light of our present knowledge, correct. Moreover we have learned that cancer of the corpus is made up of two very distinct histologic types, the adenoma malignum variety and the adenocarcinoma variety and that they occur in about equal frequency. There is, however, a distinct difference in the malignant qualities of the two groups and therefore in the prognosis especially when hysterectomy is the method of treatment followed. The prognosis in the adenoma malignum group is excellent for cure in all cases suitable for hysterectomy as the disease usually is confined to the uterus by the myometrium for a long time. The prognosis in the adenocarcinoma group is not so good even when the case seems favorable for operation because metastases are disseminated early especially by the lymphatic route. In our experience 39 per cent of the patients with adenocarcinoma of the corpus die within three years whereas in the adenoma malignum varieties only 7 per cent die in the first four years. Because of these findings it seems desirable especially in all cases of adenocarcinoma of the corpus, even if favorable for operation, to follow the hysterectomy by radiation therapy as promptly as possible consisting of x-ray and radium. The radium should be applied within the vaginal tube so as to irradiate the tissues adjoining the vaginal vault and along the canal, in order to prevent if possible the late metastases so frequently seen in and about the vagina. We believe that the entire treatment with radium and x-ray should be completed in four to twelve weeks after the hysterectomy.

For somewhat more than two years the routine procedure in cancer of the corpus cases at the Memorial Hospital has been to treat them with radium at the time of the diagnostic curettage and to follow this with high voltage x-ray unless the patient is extremely corpulent. Six to eight weeks later in all the operable cases abdominal hysterectomy has been done. Four to twelve weeks after the hysterectomy in cases of adenocarcinoma, postoperative radiation should be given.

Two interesting observations have been made, first, the hysterectomy has not been made more difficult because of the preoperative radiation; second, very little viable cancer and in more than half of the cases no cancer at all could be found in the uterus on microscopic examination after its removal.

If radiation alone is planned as the treatment of a case of cancer of the corpus it would seem desirable to check up the result by an exploratory curettage about twelve to sixteen weeks after the first series of radium and x-ray treatments have been finished, especially if there is a persistent uterine discharge of any moment. If evidence of

cancer is found at the second curettage, further radiation therapy is indicated although we believe it would be better to remove the uterus if possible.

*Ovary.*—When we attempt to discuss the treatment of malignant ovarian tumors by radiation we find ourselves at once in a difficult field, due to the fact that we are not dealing with a single variety of tumor or cancer but with cancerous tumors of quite varied histogenesis, histopathology, and gross structure.

These tumors because of their complexity and their variation in cellular characteristics must of necessity respond differently to radiation. Unless a biopsy has been obtained it is quite impossible to know the histologic character and whether or not the tumor may be radiation sensitive. In the absence of this information it becomes necessary to resort to the therapeutic test of giving a full course of radiation therapy to the tumor in order to ascertain this fact.

It is of course highly desirable for us to obtain as much and as accurate information as possible regarding the histologic characteristics of all ovarian tumors treated by radiation therapy in order that we may attempt to classify them not only according to their histopathology but according to their degree of radiation sensitivity.

Only in this way, I venture to say, with accumulated experience and knowledge will it be possible for us to make much headway in our treatment of these tumors.

In many cases the patients have already undergone exploratory operation with removal of all or a portion of the growth before they are referred for radiation therapy. In such instances slides of the tumor should be sent along to the radiation therapist for study and classification.

The end-results from operation alone in the treatment of cancers of the ovary are poor. Surgical statistics of five-year cures vary from 10 per cent to 15 per cent. Many of the patients when first seen are so far advanced that even an exploratory operation cannot be considered. In recent years gynecologists, no doubt because of these poor results, have turned to radiation therapy in an effort to improve the situation.

Reports of individual cases and of small series of cases are seen in which radiation therapy alone or combined with surgery has been used to advantage. In the advanced inoperable cases temporary palliation has not been unusual and occasionally the lesion has responded well enough to irradiation to permit a successful operation to be done at a later date for the removal of the growth.

We have formulated certain rules for the treatment of ovarian tumors, briefly they are as follows:

A. Ovarian tumors should be treated surgically unless there is some contraindication to operation. This is necessary since it is often difficult to differentiate

clinically between a benign and a malignant ovarian tumor and surgical removal of the former should always result in cure.

B. If at operation the tumor is found to be malignant but is apparently completely removed, postoperative irradiation of the entire pelvic and tumor field with high voltage x-ray should nevertheless be done within four to eight weeks. Such treatment should always include the line of incision because of the frequency of incisional recurrences from implantation metastases. This series of roentgen ray treatments should be repeated two or three months later.

C. If the tumor is malignant and at operation is only partially or not at all removed, intensive postoperative irradiation of the entire tumor field with high voltage x-ray should be established as soon as the patient's condition will permit. If the tumor masses respond to radiation but do not disappear the series of treatments should be repeated as soon as the condition of the patient's skin in the irradiated fields will permit and as often thereafter as may seem to be necessary.

D. If the clinical findings indicate that the tumor is probably malignant but is too extensive for operation, radiation therapy with high voltage x-ray or the radium pack should be intensively carried out. If thereafter sufficient improvement is obtained surgical interference may then be instituted.

E. Tumors complicated by large quantities of free fluid and, or, metastases should be intensively irradiated and observed for a time before resorting to exploratory operation as the tumor masses will, in many instances, diminish markedly in size and occasionally may disappear entirely. Free abdominal fluid if present in sufficient quantity should always be removed by paracentesis before radiation treatment is given and as often as may be necessary during the course of treatment.

Malignant ovarian tumors when classified histologically belong chiefly in the group of adenocarcinomas. Frequently one finds other qualifying terms used such as papillary or pseudomucinous or papillary cyst adenocarcinoma. In addition we have the embryonal cancers and the teratomas and those in which there is much evidence of calcium deposit in the form of psammoma bodies. We have noted a rather consistently favorable response to radiation even in cases of advanced ovarian cancer whenever psammoma bodies or marked evidence of calcium deposits are present in the tumors.

It would seem worth while at this point to briefly report certain cases.

CASE 1.—S. G., aged forty-five, admitted to the Memorial Hospital May 17, 1925. Abdomen markedly distended with free fluid, pelvis occupied by solid tumor masses rising up into lower abdomen. Exploratory operation revealed large cauliflower tumor masses apparently arising from the right ovary and now involving all the pelvic organs. Small metastases or implants were distributed throughout the peritoneal cavity on the intestines and the parietal peritoneum. Both colonic gutters were filled with tumor masses. A portion of the tumor was removed for examination, pathologic report was "probably benign papillary, ovarian cystoma." An intermediate low voltage x-ray cycle was given three weeks after the operation. Fluid had to be removed from the abdomen every six to seven weeks thereafter but five months after operation the patient's general condition seemed improved and the x-ray cycle was repeated. For the following year fluid was removed every seven to eight weeks and nodular masses were still readily palpable in the lower abdomen and pelvis. In October, 1926, one year after the second low voltage cycle, patient was given a high voltage cycle to the tumor area. Ten months later in July, 1927,

the tumors seemed limited to the pelvis and to be incorporated in one mass which had some mobility. Fluid was still being removed every eight weeks. Patient's general condition now seemed quite good. X-ray study of chest was negative. Two years had elapsed since the first operation and it now seemed desirable to advise a second investigation. July 12, 1927, exploratory operation was again done. It was found that all metastatic tumor masses had disappeared and there was left only 2 solid enlarged ovarian masses each about the size of a grapefruit, embedded in the pelvis adherent to the uterus and intestines. These tumors were removed, pathologic report was papillary adenoma malignum, marked calcification, psammoma. Patient was given a high voltage x-ray cycle two months after the operation and the line of incision was irradiated with the radium element pack two weeks after the operation. Nearly five years have elapsed since the second operation and the patient has remained entirely well. It would seem therefore that in this case an inoperable condition became operable under radiation.

CASE 2.—C. V., aged twenty-nine. Admitted to Memorial Hospital, April, 1928. Patient has never menstruated. Three years ago right ovarian cyst was removed. One year ago pain in left pelvis and back, six months ago noticed tumor mass in lower left abdomen which gradually enlarged. Six weeks ago because of very severe pain exploratory operation was done. This revealed an extensive inoperable tumor mass arising in the left ovary and reaching to the umbilicus. A portion of the growth was removed for laboratory study, the report on this was "embryonal round cell carcinoma of ovarian origin." Patient was referred to us for treatment and from April 18 to April 21 she was given a high voltage pelvic cycle, one treatment daily. One week later radium element pack treatment was started and continued from April 27 to June 9. A treatment was given every two or three days for two hours at a time to the tumor through anterior and posterior portals. A total dosage of 130,000 mc., at 10 cm.,  $1\frac{1}{2}$  mm. brass and  $\frac{1}{4}$  mm. lead filtration. On May 18 one month after the first x-ray treatment was given and when the radium pack treatment was only about half finished, the tumor seemed to have entirely disappeared. Four years have elapsed, there has been no further treatment nor has there been any evidence of recurrence or metastases.

CASE 3.—R. R., aged thirty-four, single. Patient was seen in November, 1931. Left breast had been removed ten years ago; tumor said to be malignant. Abdomen began to enlarge November, 1931, patient had previously been well. The distention increased rapidly and fluid was removed about the last of November. Examination revealed nodular hard masses filling the culdesac, extending laterally to the pelvic walls and incorporated with the uterus. Patient was referred for x-ray treatment and the abdomen was tapped whenever necessary. In a period of five months large quantities of fluid on seven different occasions had been removed. Patient was given 2 high voltage x-ray cycles, first one in November and December and the second in February. In April there was no evidence of free fluid, patient felt quite well and was gaining weight. On external examination no tumor masses were palpable. On bimanual examination there seemed to be two discrete pelvic masses each about the size of a large lemon and somewhat movable, in addition there were several small nodules about the size of a queen olive in the culdesac. The response to treatment seemed to have been unusually satisfactory, and it was decided to do an exploratory celiotomy with a view to removing the tumors if possible. This operation was done April 12 and two ovarian masses were removed with very little difficulty. There were other smaller, firmer metastases or implants in the culdesac or penetrating the broad ligament or in the uterine wall. Twenty-two gold radon seeds averaging 2 to  $2\frac{1}{2}$  mc. were placed in these scattered areas for a total dosage

of 6700 mc. Patient's convalescence has so far been uneventful. The pathologic report on the tumor is papillary adenocarcinoma Grade 2.

This case is reported because from the history it was first assumed that we were dealing with a metastatic malignant tumor from the breast and a bad prognosis was given to the family. The response of the tumor to roentgen radiation, however, changed our diagnosis to primary ovarian carcinoma with peritoneal metastases. In the three cases cited the prognosis was bad before radiation therapy was used. It would seem from these experiences of ours and similar experiences of others that radiation therapy has created for itself a field of the utmost value to the gynecologist in the treatment of many ovarian cases, frequently changing a hopeless outlook into a favorable one.

*Cervix.*—In the United States radiation therapy for cancer of the cervix is pretty generally accepted as the method of treatment regardless of the stage of disease.

In other countries, especially Germany, radical hysterectomy is still done for the favorable cases by many surgeons.

On the whole there has not been much radium available in Germany and this may be an additional reason for the frequency of operation in cases of early cervix cancer.

Cases as a rule are divided into four groups known as, (1) early, (2) borderline, (3) inoperable, (4) very advanced.

The number of early or favorable cases is quite small because the lesions are usually of the infiltrating, invading, rather than of the cauliflower variety and do not give early symptoms. Moreover the personal equation of the physician seems to be a large factor in determining classification since the percentage of favorable cases in the combined early and borderline groups varies from 2 per cent to 27 per cent in the reported statistics of different writers. It is evident that we must depend upon end-results as indicated by total salvage of all cases in order to eliminate the personal equation and obtain a proper estimate of the real value of any method of treatment.

While it is fully recognized that early diagnosis is at the moment the most important factor in prognosis, it is also realized that there are other important items which may materially alter the prognosis. This has been especially observed since the advent of radiation therapy, and we have learned that there are marked variations in radiation sensitivity of different tumors and that to some extent these variations are apparently dependent upon the cellular characteristics of the tumor. From time to time, therefore, early cases are met with which seem to be radiation resistant and do badly whereas other cases more advanced and with a poorer clinical prognosis may respond favorably and become cures.

The occasional persistence or recurrence therefore of a definitely radiation resistant lesion in a case of cervical cancer otherwise favor-

able for cure must be appreciated, and when such a case is met with, we believe it is much better to promptly resort to hysterectomy rather than to further radiation.

It would seem that all institutions which are endeavoring to carry out systematic treatment of cervical cancer, or in fact, cancer involving any other pelvic organ should be properly equipped with facilities for deep x-ray therapy by means of a high voltage apparatus, since radium used only as a local application to the cervical lesion is recognized as being insufficient. It fails to give to the large number of advanced cases adequate radiation to the outlying portions of the tumor growth. A radium element pack of sufficient size will of course do instead of x-ray but is not as economical.

On the whole it may be said that in all important clinics and centers of radiation throughout the world, radiation is today applied in the combined form consisting of (a) external radiation with x-ray and (b) application of radium at the site of the lesion. Professor A. Döderlein of Munich claims to be the first person to have established the routine use of radium and x-ray for the treatment of cervical cancer. He began his work with combined radiation in 1913. We have also followed the combined plan consistently at the Memorial Hospital since 1922. We have been pleased to observe that our constant insistence on the necessity of some form of effective external radiation to take care of the entire pelvic field is now recognized and apparently is quite generally followed elsewhere.

There are still differences of opinion as to the plan of treatment with these two agents. In the majority of clinics, and in fact, one may say practically in all clinics, except our own, treatment with radium precedes treatment with roentgen ray, and this was the plan followed by us until about two years ago.

In a critical review of our cases we were so impressed by the high percentage, not only of advanced cases, but of extensively ulcerated and infected lesions coming for treatment in which the adjoining normal tissues were considerably involved in reactionary changes, due to the presence of an infected cancer that it seemed to us to be highly desirable to spend at least a short time in an effort to prepare the lesion for the application of radium. A great part of the surface growth of these advanced cancers consists of an infected tissue which is very easily destroyed, and we had observed such lesions in many cases subside and almost disappear under x-ray therapy alone, where palliation only had been planned. Therefore, with this background of experience, we felt that we might hope to obtain greater regression and possibly a higher percentage of cures and probably with fewer radiation complications if all patients with ulcerated cancer of the cervix were first given the high voltage x-ray cycle and were required to use frequent vaginal antiseptic douches for a period of about ten days to

two weeks, preceding the application of radium. We have endeavored to follow this plan consistently in the past two years in all such cases, and I am inclined to believe that we will find it is a very valuable method, and it will give us better results than we have obtained where radium application preceded the x-ray.

However, in all favorable cases radium is used first, as in such cases there is practically no infection and the lesion is small, the x-ray cycle is then given as promptly as seems feasible after the radium. We believe it is also highly desirable to give a second roentgen ray cycle to all cervical cancers regardless of the clinical grouping eight to twelve weeks after the first radiation series has been finished.

At this point it is important to emphasize that external radiation with roentgen ray or radium element pack is not used with the idea that it will cause glandular metastases in the deeper portions of the pelvis to disappear. Anyone who uses it with this idea in mind fails to appreciate the small amount of effective radiation which reaches the deeper pelvic structures 10 cm. below the surface and also fails to realize that metastatic glandular lesions are frequently more radiation resistant than the primary lesion.

External radiation is used because it brings about changes in the connective tissue which help to interfere with the growth and activity of the cancer cells as well as with their lymphatic spread and because many of the cancer cells are instable, radiation sensitive and are readily destroyed even with the equivalent of one skin erythema dose when they are growing in the tissue spaces or in the perivascular lymphatic stream. But when these cells have established themselves in the chain of pelvic lymphatic glands external radiation is to a large degree ineffective.

Since Bonney in his operations has found parametrial glands involved in 43 per cent of his cases, it is evident that radiation therapy is under considerable handicap in endeavoring to increase the percentage of absolute cures.

Lynch in his recent communication states that in none of the cases in which he did a radical abdominal hysterectomy and found involvement of parametrial glands did the patient live five years.

Bonney with a modified Wertheim type of hysterectomy reports an absolute cure rate of 24.4 per cent.

Weibel in his most recent communication, discussing surgery and irradiation methods in uterine carcinoma, fails to give any percentages for his own work. He merely states that in 1929 the operability of cervix cases in his clinic was 70 per cent and that 120 cases were radically operated upon, but no five-year end-results are mentioned. He raises the question as to whether under radiation therapy the ratio of permanent cures will be maintained as well as with operation or will the radiation treated cases eventually develop metastases, even after



five years, more frequently than operated cases. All his patients after operation are given roentgen therapy once or twice annually for a period of several years. The radiation is applied in several small doses for a few days, four or five fields. All inoperable cases in his clinic are treated with combined radiation therapy. He states that the use of postoperative roentgen therapy definitely improves end-results and that absolute results for Wertheim's original cases continued by Kermauner (1500 surgical cases over five years) were 25.6 per cent.

Weibel further says it is not at present his intention to abandon surgery in the treatment of carcinoma of the cervix. In milder cases he will do vaginal hysterectomy because the danger of overlooking carcinomatous glands is comparatively slight, and the vaginal operation has undoubtedly a lower primary mortality. The vaginal operation will also be used in severe cases complicated by advanced age, abnormal obesity, poor general health, etc. With these exceptions abdominal operation is his method of choice as it permits a more extensive dissection of glands, etc., and gives better results although its primary mortality is higher.

It is interesting to note the comparative uniformity of percentages reported from various clinics as regards the absolute cure rate for five years with radiation therapy.

E. Muhlman	19.74 per cent	G. Döderlein	22.7 per cent
Crossen	21 per cent	Ward and Farrar	24.7 per cent
Heyman	22.4 per cent	Regaud	26 per cent
Healy	22.5 per cent		

It is also extremely interesting to note the improvement in Regaud's statistics as recently reported, especially the cures in Class 3 inoperable cases.

In 1924 they increased the dosage of external radiation with x-ray to its present level and coincident with that the total salvage of all cases treated in the clinic rose in 1924 to 35 per cent, 1925 to 32 per cent, and in 1926 to 35 per cent. This is as you see a 10 to 12 per cent greater salvage than has been reported elsewhere and is attributed largely to the present plan of external radiation. This consists of deep x-ray, started two or three weeks after radium treatment has been finished and given for two hours in the morning and two hours in the afternoon daily until one hundred hours' treatment have been given at 90 cm. with a 200 kilowatt machine.

Heyman has also, since 1929, added external radiation with high voltage x-ray to the radium treatment of all cervix cases.

In conclusion, then, one can see that it becomes difficult if not impossible to compare methods of treatment as different as surgery and radiation when one must depend upon statistics from different clinics. The quality and variety of cases seen in individual clinics varies con-

siderably, the detail of operation will vary with each operator, the methods of carrying out radiation therapy vary almost more than surgical procedures, and here again the personal equation of the physician in charge becomes very important. For one reason or another it would seem, however, that radiation therapy in carcinoma of the cervix is gradually supplanting radical surgery.

121 EAST SIXTIETH STREET

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## A CLINICAL AND EXPERIMENTAL STUDY OF ENDOMETRIOSIS\*

EDWARD ALLEN, M.D., CHICAGO, ILL.

ENDOMETRIOSIS is a topic still new enough that a review of case histories, operative procedures, and clinical results should be of value. The data contained in the following report have been taken from 112 patients exhibiting endometrial lesions. These patients have been operated upon by Dr. N. S. Heaney, Dr. Carl Bauer and myself. We have included in this study only those cases in which microscopic examination has revealed definite ectopic endometrial tissue in material removed at operation. We have omitted many in which the lesions discovered by routine examination during operations for other conditions were small enough or so situated that they could be removed with the electric cautery. Painsstaking inspection and prophylactic destruction of even these minute lesions is indicated on account of the proliferative tendencies of these growths.

*Age.*—The youngest patient in this group was seventeen years of age, the oldest, sixty-seven. Twenty-four fell between the ages of twenty and thirty; 39 between thirty-one and forty; 42 between forty-one and fifty-one. In addition there were 5 patients whose ages ranged from fifty-two to fifty-five. Only 2 of these older patients had ceased menstruating before the symptoms of endometriosis began. The oldest patient had not menstruated for twenty-two years. The rearrangement of glandular balance occurring near or after the menopause may account for the increased incidence in this decade.

*Marital and Obstetric.*—Eighty-eight of these women were married and 24 were single. Of the married group 41 had had full-term pregnancies, although in most instances these occurred a considerable time before the symptoms of endometriosis had become manifest. If we add the 18 patients who had become pregnant but had aborted to the 53 who were completely sterile and subtract a proportionate number of the 24 who were unmarried, we arrive at the rather startling

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\*Read before the Chicago Gynecological Society, March 17, 1933.

equation of a 60 per cent relative sterility. The tubes of most of these patients at least up to forty years of age have been tested. All but 2 have been found patent

*Symptoms.*—The clinical picture of endometriosis is, like many other disease entities, not always clear cut. The diagnosis is most often arrived at by a summation of symptoms and a careful rectovaginal



Fig. 1.—Section of an ovary removed from a patient complaining of menorrhagia and acquired dysmenorrhea. Grossly it resembles the follicular change produced by glandular stimulation in animals (A). The endometrial-like tissue (B) lining the chocolate cyst is compared in Fig. 2 with that of the follicle at (C).

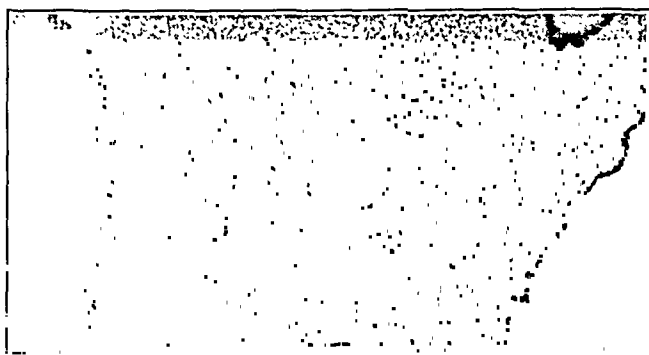


Fig. 2.—A suggestive similarity is shown here between the lining of the endometrial cyst (A) and the follicular cyst (B). We interpret them as different stages of cell metaplasia, controlled by glandular influence.

search for the characteristic nodulation or puckering in the culdesac or rectovaginal septum. Gross lesions of the ovaries and uterus usually produce symptoms and vaginal findings about which there can be very little doubt. Occasionally, however, a widespread endometriosis causes few if any symptoms and is only discovered during operations for other conditions.

The prominent symptoms included menorrhagia in 61 cases, metrorrhagia in 18, backache in 48, dysmenorrhea in 48, and lower abdomen pain in 25.

We shall discuss the high incidence of increased bleeding later.

The backache was lumbosacral in type and did not exhibit distinguishing features that would differentiate it from backache occurring in other gynecologic conditions. In many instances the dysmenorrhea was of the essential type. About one-fourth of the remainder complained of the rather characteristic acquired form of dysmenorrhea usually ascribed to endometriosis, i.e., pain beginning some time before the flow is established, reaching an acme during the early hours of the period and gradually subsiding as the pelvis returns to the resting stage.



Fig. 3.—Higher magnification of the endometrial-like layer lining the chocolate cyst shown in Figs. 1 and 2. The glandular arrangement of the epithelium and stromal cells is characteristic. Localized hemorrhage has occurred at (A).

Rectal pain or discomfort during bowel movement was present in eight instances when the lesion involved the rectovaginal septum or the depths of the culdesac.

*Pathology.*—The distribution of the lesions was as follows:

Ovaries	60
Uterus	53
Peritoneal	16
Adenoma rectovaginal septum	37
Abdominal	3
Bowel	4
Bladder	3
Appendix	1

The apparent discrepancy in total is due to the fact that multiple lesions occurring in the same patient were charted under their appro-

appropriate heading. Two of the patients presenting lesions of the abdominal wall had been operated upon previously during pregnancy. The other 2 followed salpingectomy at other hospitals. With the exception of one case, there was no evidence of mechanical effect on the intestine in either the lesions directly on the bowel, in the rectovaginal septum, or in general pelvic distribution. Dr. Heaney had performed a previous laparotomy on the exception noted for the resection of an endometrioma perforating the bladder. He has reported this case. The lesion was either overlooked at this time or had grown in the two years since the previous operation. A marked angulation of the ileum had occurred. The lesion was removed from the bowel wall without entering the lumen and the angulation relieved.



Fig. 4.—A cross-section of uterine wall showing marked endometrial invasion (A); adenomatous areas (B); and several seed fibromyomas in the process of growth (C). This section strongly suggests that all of these lesions are caused by the same factor or factors influencing cell growth.

Fibromyomas were discovered in 46 of these patients and in large part accounts for the high incidence of hysterectomy. Fifteen additional uterine tumors revealed adenomatous change. Exactly one-half of these patients therefore exhibit tumors of that portion of the pelvis most intimately affected by hormonal substances. Are they the mechanical cause of their associated endometrial lesions and the bleeding or are they more apt to be the result of the same factors operating to cause the remaining 50 per cent?

*Treatment.*—Since most of these patients were relatively young women and often sterile our aim has been to preserve function even at the risk of future operative procedure. Our combinations of procedure parallel very closely those of Keene and Kimbrough<sup>1</sup> and we agree with

them in that conservatism is indicated. The different types of procedure included hysterectomy in 82 cases, resection of growth in 41, unilateral oophorectomy in 36, and bilateral oophorectomy in 13.

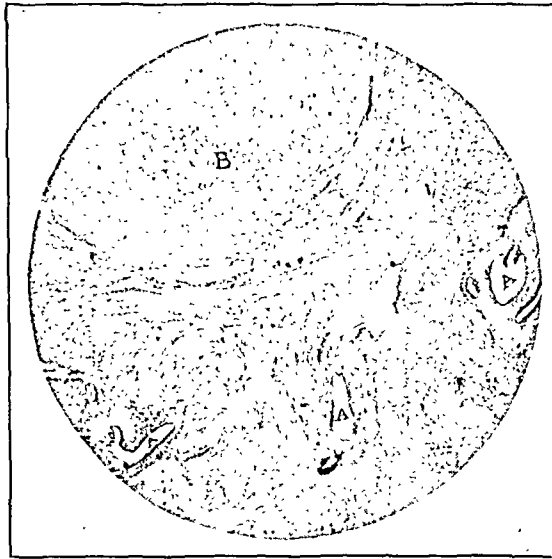


Fig. 5.—A higher magnification of an area shown in the previous plate. Areas of endometrial change are to be seen at (A) just outside of the compact myometrium surrounding the small fibromyomas at (B).

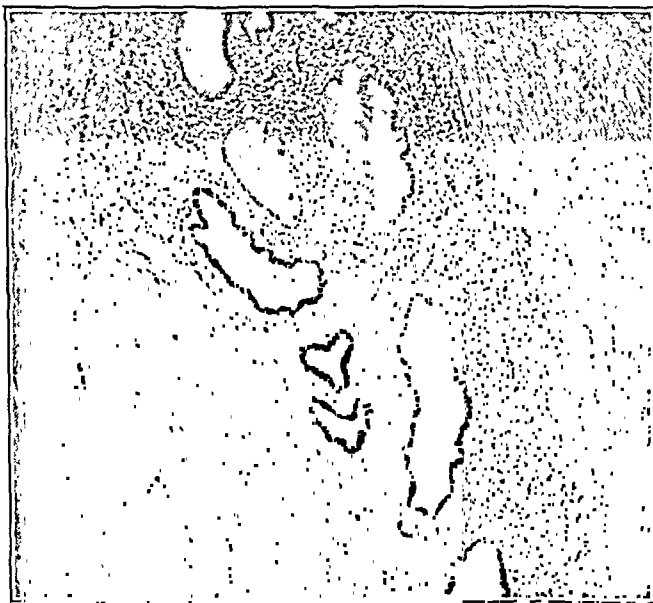


Fig. 6.—Area of adenomyosis occurring in the depths of the uterine wall exhibited in Fig. 4. Study of such areas leaves one with the distinct impression that the stromal connective tissue cells are localized outgrowths or metaplasias of the adult uterine connective tissue as a result of some powerful stimulus to cell growth.

Ovarian function has been retained in all but 13 of these patients. Nine of the 13 patients were over forty years of age and all presented lesions that were not resectible. Eight of the 30 women treated con-

servatively have given birth to 9 viable babies following operation. To offset this increase in fertility and retention of ovarian function 6 have returned to us for a second operation. Many of these procedures have been carried out through the vagina, especially the removal of adenomas of the rectovaginal septum. The only mortality in this series occurred following the resection of one of these tumors



Fig. 7.—Entire section removed from the cervix of a twenty-four-year-old nullipara whose chief complaint was irregular menorrhagia, characteristic of glandular dysfunction. The only other lesions found were endometrial hyperplasia and a blood cyst of the left ovary. No endometrial tissue could be demonstrated in the ovary. There is a rather marked hyperplasia of the squamous layer (A) and a definite island of endometrial tissue just beneath it (B).

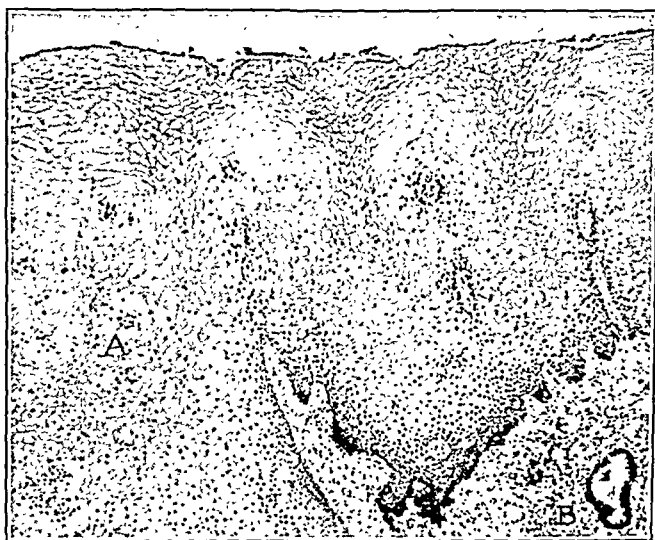


Fig. 8.—A higher magnification of the cervical mucous membrane shown in Fig. 7. The atypical stroma and epithelial arrangement can be seen at (A) and (B).

from the rectal wall. The bowel was opened in four instances during the total operative procedures. We would reserve castration either by operation or x-ray for those patients at or near the menopause, a few of those patients in whom recurrent symptoms demand relief or who present lesions too extensive and involving important structures to be easily resectible.

During this analysis we were impressed by several outstanding features. First, and we think most important, was the high incidence of menstrual irregularities. Second, regular appearance of associated benign uterine tumors. Third, marked prevalence of relative sterility, and last, the wide distribution of the lesions.

The marked irregularities in the menstrual habit immediately suggest a glandular imbalance. This hypothesis more accurately explains those instances of irregular bleeding occurring in patients in whom the lesions were insignificant or at least so located that they could not very well have been the mechanical cause of change in the menstrual flow. Bleeding occurred from the endometrium in all stages of development, although that representing the Swiss cheese type of hyperplasia was the most common. This condition is regularly designated in the literature



Fig. 9.—The stromal cells, and the arrangement of the epithelial elements are quite characteristic for endometriosis. The granular cytoplasm of the epithelium is cervical in type.

as glandular hyperplasia. Many observers<sup>2, 3, 4, 5, 6</sup> report the frequent occurrence of these stigmas of glandular activity in patients afflicted with endometriosis.

The high incidence of fibromyomas is noteworthy. Many observers have corroborated this finding and have attempted to explain most of the increase in bleeding and many of the cases of sterility on this basis. It would seem more logical to us to include these masses of functionless tissue as an end-result of hormonal cell stimulation, another type, or example, of cellular metaplasia caused by an underlying glandular dysfunction. Recent investigation indicates that this is true. Zondek<sup>7</sup> and Fluhman<sup>8</sup> have demonstrated a measurable amount of prolan A in the urine of about one-third of their cases of fibroids. Similar observations have been made in a few instances of exophthalmic goiter.

This postulate which is not new has many interesting and important angles. If we accept it as a starting point, it will lead us into the field



of the cause of all benign tumors. Further metaplasia or dedifferentiation carries one directly into the realm of malignancy. Smith<sup>9</sup> lists the complicating tumors in his series of 159 cases of endometriosis as follows: Fibroid or fibroids, 82; gland hypertrophy of the endometrium, 66; endometrial polyp, 15; cervical polyp, 5; adenocarcinoma of the

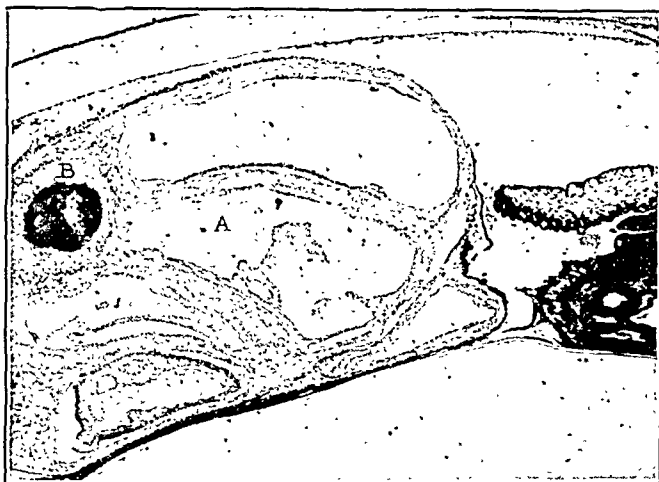


Fig. 10.—Cross-section of the anterior chamber of the eye of a rabbit. Ovarian tissue (A) shows nicely the result of prolonged stimulation with Follutein. The blood cyst (B) resembles that described from the patient in Fig. 7. Endometrial tissue transplanted into the opposite angle will be illustrated in Fig. 13.

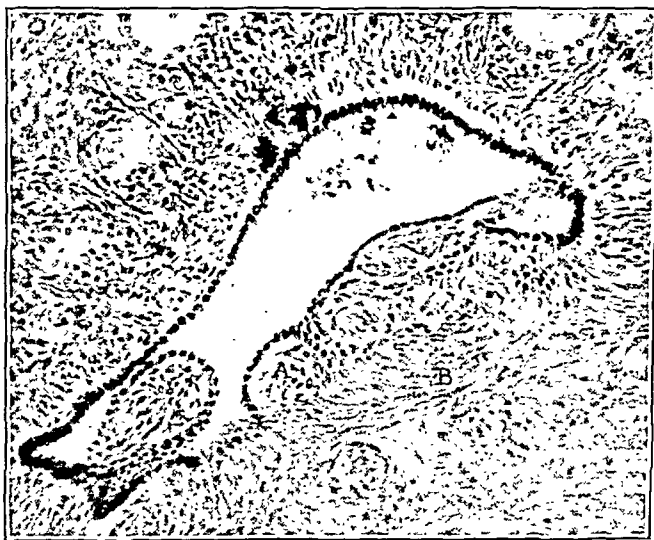


Fig. 11.—An area of atypical follicular epithelium occurring almost in the center of the ovary described in Fig. 10. The stromal cells (A) around it are distinctly different from the surrounding ovarian stroma (B).

endometrium, 4; carcinoma of the other ovary, 4; papillary serous cystadenoma of the other ovary, 3; papillary serous cystadenoma of same ovary, 3; bilateral papillary parovarian cyst, 1; sarcoma of the ovary, 1; fibroma of the ovary, 1; malignant papillary pseudomucinous cystadenoma of the left ovary (and diffuse uterine endometriosis), 1;

benign pseudomucinous cystadenoma of the ovary, 3; pregnancy on same side as endometrioma of ovary, 1; sarcomatous degeneration of a fibroid, 1; leiomyosarcoma of uterine wall, 1; adenocarcinoma of the cervix, 1; kraurosis vulvae, 1; carcinoma of breast, 1.

The female breast is the commonest location for benign and malignant tumors in the human body. Its structure and function is directly controlled by glandular action. Zondek<sup>7</sup> has isolated prolactin A in increased amounts from the urine of 80 per cent of patients afflicted with cancer, this being especially true of genital tumors. One might surmise that the excessive amount of hormone excreted in the urine during pregnancy may be definitely connected with the increased rapidity with which cancer spreads during gestation.

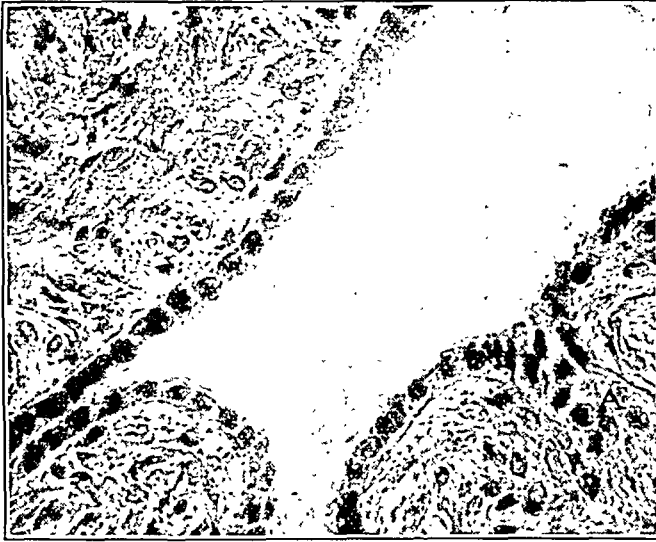


Fig. 12.—A higher magnification of the area described in Fig. 11 which suggests a transition of connective tissue into cells of atypical epithelium (a).

Jeffcoate<sup>10</sup> was so impressed in his study of 200 pituitaries, with the apparent increase in activity histologically of the anterior lobe and the evident decrease in the posterior lobe, that he treated several inoperable carcinomas with pituitrin plus theelin. Necrosis at the periphery of the lesion with consequent covering by normal skin are highly suggestive. Further animal experiments by this author and Zondek<sup>7</sup> tend to substantiate his rationale. Glandular therapy offers possibilities far beyond that of curing a simple menorrhagia or dysmenorrhea.

On the other hand, promiscuous administration of these powerful agents may be fraught with considerable danger to the patients.

One of our associates cites the case of a young woman, twenty-four years old, who lost both ovaries on account of cystic swellings 10 cm. in diameter, following the prolonged administration of anterior pituitary extract. In one of the cases here reported a chocolate cyst of the ovary and transplants on the peritoneum seemed to follow several series of glandular treatment. She had been treated since the onset

of menstruation conservatively for idiopathic hemorrhage. The same factor operating through the years which caused the menorrhagia may have produced the endometriosis. Hysterectomy performed at the age of twenty-two following three years of sterile married life and uncontrolled bleeding revealed also many small fibromyomas in this young woman.

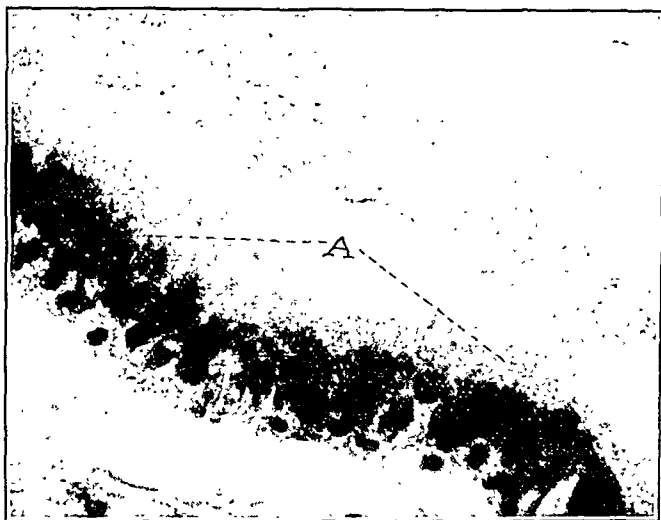


Fig. 13.—The endometrium transplanted as described in Fig. 10 has assumed many of the characteristics of servical epithelium, i.e., high columnar type of cell, typical nuclear position, secretion granules (A) at the tips of the cells and the typical staining reaction to hematoxylin.

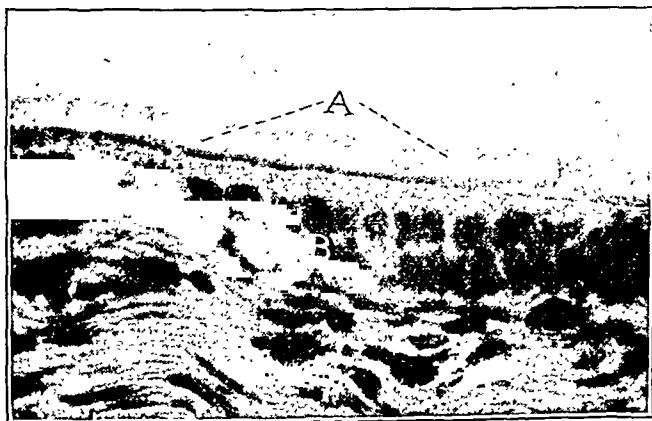


Fig. 14.—The endometrium transplanted into the eye shown here has under the influence of constant stimulation with antuitrin S taken on many of the marks of tubal epithelium. The marked ciliation (A) and cell form are well shown (B).

The wide distribution of the lesions corresponds to that reported by many investigators. This fact is the most difficult problem for the theorists on etiology. It necessitates the acceptance of a combined mechanical dissemination as suggested by Sampson or the opposite theory supposed notably by Novak that isolated islands of normal cells may undergo a change in cell type into endometrial-like tissue. We have ample evidence that hormonal activity causes this very frequently in the pelvic organs. The change in type of cell surrounding the

primordial follicle as it passes through the ripening phase is quite familiar. Recently Papanicolaou has reported the apparent transformation of the undifferentiated connective tissue of the tunica propria in the endometrium of guinea pigs to that of normal epithelium. Microscopic examination of an ovary exploded with the active principle of pregnant urine is quite impressive in this connection. The appearance of the so-called pregnancy cells in the pituitary is suggestive of cell differentiation under the influence of hormonal activity. Several authors<sup>11, 12, 13</sup> studying the tubal mucosa have noted cyclic changes in epithelial morphology.

The high incidence of sterility, in spite of patent tubes and potent mates, suggests some disturbance in physiology rather than mechanical interference. Sterility is a common result of glandular imbalance characterized by menstrual irregularities.

We have just begun experimental work along these lines. Prolonged excessive stimulation with potent extracts offers a plan of attack. Constant visibility of transplanted tissue in the anterior chamber of the eye combined with tissue in situ offers added opportunities for observation. Figs. 1 to 14 exhibit instances of cell metaplasia produced in transplanted tissue and suggestive material culled from our histologic study of endometriosis in the human female.

Definite conclusions cannot be drawn but this combination of clinical and experimental work suggests:

1. Endometriosis is a manifestation of cellular metaplasia caused by glandular dysfunction.
2. Fibromyomas and fibroadenomas are additional results of changed cell stimulation.
3. The gap between benign and malignant tumors may be only a qualitative or quantitative measure of hormonal action.
4. Until we know more about their action prolonged administration of potent glandular products may be fraught with danger.

#### REFERENCES

- (1) Keene, F. E., and Kimbrough, R. A., Jr.: J. A. M. A. 95: 1164, 1930. (2) Taylor, H. C.: AM. J. OBST. & GYNEC. 23: 307, 1932. (3) Shaw, W.: J. Obst. & Gynec. Brit. Emp. 36: 1, 1929. (4) Beckman, M.: Arch. f. Gynäk. 135: 519, 1929. (5) Novak, E., and Martzloff, K. H.: AM. J. OBST. & GYNEC. 8: 385, 1924. (6) Tietze, K.: Arch. f. Gynäk. 146: 197, 1931. (7) Zondek, B.: AM. J. OBST. & GYNEC. 24: 836, 1932. (8) Fluhman, C. F.: AM. J. OBST. & GYNEC. 20: 1, 1930. (9) Smith, G. V.: AM. J. OBST. & GYNEC. 17: 806, 1929. (10) Jeffcoate: Lancet, March 26, 1932. (11) Schaffer: Monatsschr. f. Geburtsh. u. Gynäk. 28: 526, 1908. (12) Snyder: Bull. Johns Hopkins Hosp. 24: 124, 1923. (13) Novak and Everett: AM. J. OBST. & GYNEC. 16: 499, 1928.

55 EAST WASHINGTON STREET

#### DISCUSSION

DR. N. S. HEANEY.—Dr. Allen's idea regarding endometriosis is a departure from the ideas held by most of us, of the mechanical nature of the origin of endometriosis; the cells are displaced from the endometrium or from the tube and

become implanted either on the ovary or in the culdesac, and there develop the original type of tissue from which they are derived. Dr. Allen believes that he finds evidence as a result of his experimentation in the transplanted tissue in the eyes, of a metaplasia or transition of one type of tissue to a type entirely different.

DR. ALLEN (closing).—I cannot help being impressed by the marked evidence of cellular change observed in many of the ovaries removed at operation which corresponded so closely to the changes seen in the stimulated ovarian transplants or in the routine Zondek tests. I think it is more logical to explain these growths on this basis of cellular change than on the basis of displaced tissue.

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## THE CALCIUM PROBLEM IN PREGNANCY\*

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**D**ISORDERS of the oral cavity during gestation are not ordinarily so important in themselves, but they achieve importance as the significant signs of systemic unbalance and as vital factors in the comfort and safety of the mother and child.

The tradition is still widespread that every child will cost a tooth but only in the last year or so has it been revealed why this sacrifice, if true, is required.

Why, we ask, should a normal woman with good teeth and perfect fillings suffer impairment of one or both of these after two or three months of gestation, while diet and habits of life remain practically unchanged?

Primarily a few well-known beliefs can be mentioned which have gained in repute rather than lost by scientific progress. For instance we can still accept the opinion that proper food, in adequate amount, during the prenatal period is essential to the normal development of the permanent as well as the deciduous teeth of the babe. Essential, because calcification begins as early as the seventeenth week of intra-uterine life while the crowns for the most part are formed before birth.

Teeth are closely related in chemical composition to the bones, and since the fetus is a true parasite, the minerals for bone and tooth formation, especially calcium, must be obtained either from food through the mother, or at her expense. The calcium reaches the fetus easily by way of the placental circulation. Bar has estimated that during the latter months of pregnancy the fetus requires 0.638 gm. of calcium per day which is more than the entire intake by food for most women, for the usual American diet is deficient in the calcium derived from dairy products. Sherman has found that the average amount of calcium furnished by the food is 0.45 gm. per hundred c.c. of protein, while a whole gram is needed to maintain the calcium equilibrium. Our people are tooth conscious but not as yet diet conscious. If therefore the food does not supply the required amount of mineral matter,

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the fetus will demand and take the salts of calcium and phosphorus and other materials from the bones, the blood, and the teeth of the mother. This process may continue until not only is the most careful dental work wholly lost through enlargement of filled cavities, but the maternal health may be seriously disturbed, the structure of the child threatened, and the pregnancy endangered. In this calcium crisis the mother must eat for two.

The trabeculae of bone and teeth represent storehouses of easily available calcium, and when this supply is exhausted the shafts of the long bones are compelled to contribute.

The utilization of the calcium, taken up from within or artificially supplied, depends entirely upon the vitamins C and D which must be present in the food consumed or furnished additionally to correct the defect.

In children frequently and in adults more rarely except under special conditions the unsuccessful utilization of calcium and phosphorus produces rickets on account of the lack of vitamin D, while the lack of vitamin C, with the same deprivation of salts, results in scurvy.

Pregnancy may by its unusual demands or imperfect utilization of calcium and phosphorus exhibit rickets and scurvy as well as more serious diseases, which reveal their earliest symptoms in the mouth as dental caries or gingivitis or both.

Let us consider briefly the calcium and phosphorus necessities for the mineralization of the fetus which Hoffstroem says has a storage capacity at term of 30.5 gm.

Normally the blood serum carries approximately 10 mg. of calcium to each 100 c.c. of serum and the body as a whole 3.7 mg. of phosphorus. The maternal bones contain about 85 per cent of calcium. The fetus demands 0.006 gm. of calcium per day during the first three or four months and 0.6 gm. per day at term. Bar, as well as Givens and Macy, offers an even larger estimate. A certain proportion of this amount could be furnished by special foods since cow's milk gives up 30 per cent and human milk 70 per cent of its calcium.

There is much evidence (La Mer and Chown) that normal calcification depends very largely upon the calcium solution in the blood being saturated. Mazzacco, Krebs, Briggs and Anderson have observed a definite diminution of calcium in the blood of the pregnant as compared with the nonpregnant individual. So that in spite of the increased demand for calcium in pregnancy, the deficiency is often as much as 0.42 mg. per 100 c.c.

In consequence of defects of mineralization through absence of vitamin D, dental caries ensues. The opinion is general among dentists that tooth deterioration begins on the hard enamel sheathing and works inward, hence, the unqualified statement just made will meet with much doubt and incredulity from men who have been reared

upon different faiths and principles and the reasons for it must be set forth. What is the cause of dental decay?

Bacterial activity is broadly accepted and heralded as one of the sources of caries according to the chemicoparasitic theory but definite objections appear. The fact that bacteria are always present in carious dentine or enamel proves nothing since every cubic centimeter of saliva contains normally from five to fifty millions of bacteria. Admitting, as we must, that certain germs may traverse healthy tissue and infect distant organs as, for example, when the *B. coli* moves from the rectum to the bladder or kidney, still the bacteria of the mouth are not known to have such ability. With this preamble the report of Jones, Larsen and Pritchard of Hawaii is most significant. They review 140 cases in which many teeth were found to be decayed before eruption occurred. In the babies autopsied there was no cell infiltration, no soft tissue reaction, no evidence of bacterial invasion in the bone crypts nor any osteoclasts. If such evidence proves anything it proves that the presence of bacteria must be regarded as incidental and secondary rather than causative in caries. Such evidence would indicate that dental caries is a chemical process in which systemic conditions are definitely potent.

Particles of food, stagnant deposits of carbohydrates, lodged between the teeth and encapsulated by mucin may, it is claimed, form culture media in which microorganisms develop and secrete an acid which injures the enamel. Under normal conditions this theory cannot be reasonably defended because the ptyalyzing action of the saliva catabolizes the food fragments in a very short time and the resulting sugar or débris is carried away before the bacteria or their acid products could affect the teeth. Furthermore this process would be impossible in those cases where decay occurred in unerupted teeth. Hence this hypothesis is apparently incompetent per se.

Salivary acidity and alkaline buffer substances may, however, vary so as to be favorable or unfavorable to the production of caries, as Brooker has stated. Now calcium and phosphorus are the most important alkaline buffers which are carried in the blood or excreted by the saliva and a diminution of these substances or a failure in utilization through the absence of vitamin D, might perhaps diminish the immunity and allow an acid plaque to form and destroy the enamel. The hardness of enamel however enables it to resist attack until a  $P_H$  5 is reached, but it seems hardly probable that such a degree of acidity could be produced and retained unless the alkaline elements in the blood, calcium and phosphorus were so markedly deficient that their immunizing power was destroyed. Jones and Larsen found that children of three years or older who are fed on enough fruits and vegetables to produce an alkaline ash would invariably have sound enamel and arrested decay.

The parathyroid glands, according to Falta, receive unusual demands in pregnancy and in their response a latent deficiency of calcium is unmasked. The physiologic function of the parathyroids is to regulate calcium metabolism and maintain it at a definite level in the blood. This office is accomplished by withdrawing calcium from the spongiosa of the bones for systemic utilization. The calcium thus borrowed is not returned but is excreted through the bowels and kidneys. In a way this endocrine theory is important since the effort of the glands to restore a depleted element decalcifies the teeth and so reduces the immunity, as to permit the assaults of local, and possibly acid (?), agents. Though parathyroidectomy results in hypocalcemia yet the consequences of the operation upon the structure of the teeth have not thus far come to our attention.

The most generally accepted theory of the cause of caries in pregnancy, and indeed elsewhere, assumes that the oral secretions become extremely acid and as a result the surfaces immersed in saliva or merely moistened therewith will break down. Milton says the caries of dentine is much more rapid than enamel and that the process removes both the calcium salts and inorganic matter. He holds also that caries of enamel can be produced by very dilute acids. The statement as presented is not convincing.

The teeth are composed of inorganic material protected by a flinty enamel which makes them chemically inert. They occupy a moist sterile chamber subject to wide variations of temperature, atmospheric gases and contacts with food products. If, as postulated, dental caries consists of localized areas wherein the mineral constituents are dissolved away by oral acidity or enzymes then the entire denture must be equally exposed to the action of eroding acids and yet most frequently only one tooth breaks down on its outer or lateral face while its contacting neighbor is unblemished. Such a process does not seem to be chemically plausible unless the theory of plaques is sustained.

The normal saliva, at  $P_H$  7.1 to 6.6, is neutral or mildly acid and while this acidity of course may be increased at times yet this change is neither sufficiently frequent nor sufficiently intense to account for the occurrence of caries either in the pregnant, the nonpregnant, or in men in the absence of other conditions. Brooker reports that enamel is not destroyed until the acid concentration is 100 times the acidity of normal saliva.

Blue litmus turns red when held in contact with carious dentine but litmus changes at a  $P_H$  of 7.0 and will turn red any time if placed in contact with gingival tissue.

The Jones, Larsen report refers to the fact that many teeth are decayed before their eruption would place them entirely beyond the reach of local acid changes and demand the presence of a systemic



condition which must of necessity be an acidosis or some form of physiologic unbalance such as a calcium deficiency or an inactivity of the alkaline neutralizing or immunizing agent.

In this connection it is not amiss to add a word on mouth washes. Hanke declares that the most scrupulous care of the oral cavity is no insurance against decay. Bunting reports upon three groups of children who had a diet which included an abundance of milk, fruit, and green vegetables and was otherwise well balanced. In these groups caries was diminished or entirely prevented whether aseptic mouth washes were or were not employed. In group diets which varied from the normal standards, the caries was not arrested but continued active regardless of the presence or absence of aseptic lotions.

Bunting's report brings us to the consideration of the highly important factor of diet in caries. Researches into dietary conditions have established beyond question that food has an inherent and fundamental relationship to the occurrence of caries.

Boyd and Drain had diabetic children placed upon a diabetic diet with cod liver oil and no cereal. The active cases of caries hardened and ceased. Normal children were placed on a cereal-free diet and the carious pits healed and the process stopped in ten weeks. The inference is unescapable that the exclusion of cereals hastens the cure of caries.

In Mellanby's cases again the cereal was not removed from the diet, but in one group oatmeal was added and as a result the occurrence of caries was more frequent. Mellanby, therefore, concludes that cereals interfere with calcification. In another series she used two diets consisting of, (a) Most milk, meat, eggs, and cod liver oil. (b) Least milk, eggs, and no cod liver oil but also oatmeal, and she found after eight months that caries occurred four times as often in (b) as in (a). This is doubtless on account of the increased acidification of the tissues which the starch diet imposes.

Perhaps vitamin D, should be added to that in the cod liver oil. Vitamin D, in the form of viosterol, facilitates the metabolism and utilization of calcium, while the deprivation of vitamin A, found in cod liver oil and elsewhere, favors focal infections. Hence, an abundance of these agents must be provided to protect the teeth and gums in pregnancy.

Hawkins declares that the acid-base balance and calcium-phosphorus balance with vitamin D, are the principal factors concerned in caries. In his opinion also, too high a percentage of cereal foods is a mistake. Cereals should not exceed 20 per cent of the diet and where necessary, the diet should be corrected with vegetables, meats, fresh eggs, milk, and cheese with the addition of vitamin D, in the form of cod liver oil or viosterol.

Apparently even a high blood calcium may not be utilized owing to defects of metabolism through lack of vitamin D. Sherman, Davis, Boyd, Drain and Nelson, Bunting, Hadley, Jay, and Hard, Richardson and Hanke believe that dental caries can be arrested if the patient will diet properly and Mellanby's striking experiments justify their opinion. The daily minimum requires a pint of orange juice, one lemon, tomatoes, eggs, calcium lactate and vitamin D, either as cod liver oil or viosterol. Jones and Larsen further report in their series on two breast-fed babies whose badly decayed teeth erupted at the ninth month. After six months of free diet on cow's milk, fruits, vegetables, etc., the decay was arrested. Agnew maintains that dental caries can be produced or prevented in laboratory animals at will by dietary means.

From the data presented it does not seem unwarranted to assume that dental caries is due *primarily* to a deficiency in the blood of calcium or phosphorus or both, or to an inadequate utilization thereof owing to the absence of vitamin D, which leaves the teeth unprotected. The evidence would indicate that diet if not the essential cause is at least the most important factor in the production of caries.

Brooker states that the chemicoparasitic theory of caries held by dentists is *almost* a complete explanation. The difficulty rests in the word *almost*. This hypothesis does not adequately explain the occurrence of caries, with or without plaques, unless a deficiency of the alkaline buffer in the blood and saliva is accepted. It certainly does not explain caries in unerupted teeth.

With a deficiency of calcium or phosphorus or both, the chemical accessories in the mouth may become effective and possibly satisfy all the conditions not alone for the pregnant but for the nonpregnant and for men. That immunity to caries is uncommon in children and inconsistent in adults, especially in pregnancy, is not inconsistent with the theory of protective mineralization which the data herewith presented would appear strongly to support.

Therefore, the statement may be repeated that in consequence of defects in mineralization through absence of vitamin D dental caries ensues. It is immaterial to the purposes of this paper whether the mineralization is found to be deficient in the blood, the salivary secretion or both.

If the study now moves to inflammation of the gums a slightly different pathology is revealed.

Rickets at present is recognized as a calcium deficiency disease with a lack of phosphorus also and in particular of vitamin D. Vitamin D, the "antirachitic factor," the "calcifying factor," is a substance essential to normal calcium metabolism and brings about increased retention of calcium (Cantarow). At present it is administered to best advantage as viosterol.

Scurvy is often associated with rickets and probably the vitamin C which is the vitamin lacking in scurvy is also occasionally lacking in rickets. Both rickets and scurvy result from calcium and phosphorus deficiency not necessarily from diminished blood content but from defective utilization on account of the low phosphatic concentration in the blood and especially from lack of those dominant vitamins C and D. Calcium and phosphorus metabolism are very intimately related.

Scurvy is one of the oldest diseases known. In addition to the more or less obvious hemorrhages which occur from the gums and elsewhere as the disease progresses there is a failure of the normal deposition of calcium and phosphorus in the bones though the diet may contain an abundance of both elements.

Salter has recently made a study of scurvy to determine whether the stores of lime salts in the bones were depleted while the calcification of the growing portions were inhibited through lack of anti-scorbutic vitamin C.

At various stages of the experimental disease the missing vitamin C was supplied as orange juice and at the same time alizarin was injected so that the newly deposited bone salts would be stained red and easily detected. The Boston investigator discovered that in healing scurvy the epiphyseal line was especially well marked and showed a deposition of the salts in the zone of rapid calcification.

Furthermore, the cancellous tissue of the epiphysis and diaphysis was stained and the pink trabeculas extended a small distance into the medullary cavity. The shaft too was colored by the dye distal to the epiphysis but not so deeply as the trabeculae. On the contrary the bones of animals receiving no vitamin C, were not stained by the dye though their ration contained calcium and phosphorus.

As in rickets and dental caries then, defective calcification of the bones is one of the signs of scurvy. The demonstration that this disease affects the storage of bone salts in the trabecular areas as well as their deposition in the epiphyseal tissue is important, since it shows that the increase and functional activity of bone cells can be encouraged by an abundance of antiscorbutic vitamin.

Dalldorf has established the fact that the hemorrhagic diathesis in experimental scurvy develops earlier than any other known sign of the disease and persists in some degree throughout. Gingivitis of pregnancy is a typical illustration of this phenomenon.

Scurvy is essentially a capillary disease. The pathologic change in experimental scurvy (Findlay) is swelling and degeneration of capillary endothelium whereby the flow of blood through the capillaries is retarded and congestion ensues. The degeneration of the endothelium damages the intercellular substance and edema and hemorrhage follow, while stagnation in the blood stream causes deficient oxygenation of the tissues.

Hanke finds experimentally that a diet rich in vitamin C will not infrequently reduce the thickness of the peridental membrane and convert soft, spongy, hyperemic, gingival tissue into a normal condition.

The pulp, the peridental membrane, and the gingival tissue are histologically continuous and have a common embryologic origin. It is probable, therefore, continues Hanke, that pulp changes in the human subject may occur even earlier than corresponding alterations in peridental and gingival tissue.

The evidence all leads to the conclusion that deficiency of vitamin C is an important factor in producing changes in the pulp, the peridental membrane and gingival tissues. Admitting this, then vitamin C deficiency goes still further to controvert the theory that dental caries though a chemical process is purely local and due to bacterial fermentation as well as to deny that spongy gingival tissue and pyorrhea are due to bacteria which cannot be removed from the mouth. Cellular metabolism is the main issue. If healthy cells can be produced by appropriate nourishment it might be possible to eliminate bacteria from infected areas and keep them out.

This part of the subject has been discussed with some tediousness not only for its intrinsic importance but because it plays so significant a rôle in our thesis, the elaboration of which leads us now briefly to consider the logical extension of the calcium problem to its influence in eclampsia.

Guanidine, according to Major, is toxic both to muscle and liver. This observer maintains that the presence of guanidine is responsible for the eclamptic convulsions and also that it is the toxic factor in uremia, osteomalacia, liver necrosis, and the tetany of pregnancy which Richardson has emphasized. This agent is a waste product of voluntary muscle action which, like the acidity of the mouth, is neutralized under normal conditions by calcium. Anderson found a low calcium content in 82 per cent of 44 cases of eclampsia (9 mg. per 100 c.c. or less).

Mitchell first called attention to the value of calcium in eclampsia. Drennan, Kehrer and others exploited the idea. Practically, we learn that prompt relief of the symptoms has followed though not always the intravenous injection of 10 c.c. of a 10 per cent solution of calcium gluconate in eclamptic and preeclamptic states. The subsidence of the serious features of the attack may occur as quickly as twenty minutes after medication. Lopez has had good results from injections of 20 to 30 units of parathyroid hormone.

The strict milk diet which has been almost a routine in the therapy of this disorder can be evaluated now, not on the ground that it excludes other and more toxic foods, but because it furnishes the necessary calcium in an easily assimilable form.

Minot and Cutler, quoted by Cantarow, noting the resemblance between the pictures of eclampsia and acute hepatic injury in dogs, studied the guanidine content of the blood in eight patients with pre-eclamptic toxemia and four with eclampsia. Guanidine was increased in every case. Striking relief from the urgent symptoms followed the intravenous injection of calcium gluconate in both types. In a few hours the convulsions ceased, the headache and dizziness disappeared and the blood pressure dropped. These experiments have been reproduced in the prenatal clinic at the Northwestern University Medical School by Drs. Richardson, Gregory, and Serbin with similar success. Thus a definite group of disorders confront the doctor or dentist. What can he do to control them?

The treatment of these phases of hypocalcemia follows easily from the etiology. Vitamin C is abundant in orange juice and milk. Vitamin D is readily available in cod liver oil and viosterol (irradiated ergosterol) or even in the normal skin when exposed to sunlight or the mercury lamp. Viosterol is the most satisfactory because it not only increases the metabolism in the gastrointestinal tract but encourages the storage of calcium and phosphorus in the spongiosa of the bones. Indeed calcium in the absence of vitamin D, and phosphorus without C, are neither absorbed nor utilized. Mellanby's experiments with diets (a) and (b) clearly show the value of cod liver oil where the teeth are breaking down.

The numerous investigations and diverse experiments all lead us logically to conclude that dental caries, either in or out of pregnancy, is due to dietary conditions wherein a deficiency of vitamin D and calcium are conspicuous factors. It seems equally plausible to conclude that the gingivitis of pregnancy is due to a deficiency of calcium and phosphorus together with a lack of vitamins C and D and that this particular complication falls regularly into line as a premonitory symptom of scurvy.

The evidence also seems to indicate rather clearly that dental caries and gingivitis which often lead to tetany, rickets, scurvy, osteomalacia and possibly to eclampsia and acute yellow atrophy of the liver form a common group of calcium deficiency disorders with phosphatic complications as important accessories.

The therapy then must be largely dietary. For instance the premonitory symptoms of tetany such as fragility and brittleness of the teeth, caries, defects of the enamel, hyperemia of the pulp, brittleness of the hair, longings, loss of the nails, cachexia, muscular weakness and above all the nocturnal cramps in the legs, tachycardia and convulsions which Richardson has so adequately described, may be quickly relieved by adding to the diet an excess of milk, cream, cheese, eggs, butter, fruits, and vegetables with a low cereal selection and supplying

also calcium lactate or chloride, viosterol or cod liver oil with sunshine or the ultraviolet lamp. The Mellanby reports also strongly accent the importance of vitamin D, found in cod liver oil and viosterol and state that ordinary carious processes are arrested sometimes in two weeks; that no new cavities form and that the carious surfaces show increased hardness from the recalcification of the disintegrated dentine.

For the gingivitis and pyorrhea with redness, swelling and bleeding of the gums and loosening of the teeth, the cereals must be omitted and a diet prescribed of raw whole milk, buttermilk, oranges, peas, beans, cabbages, tomatoes, etc., for vitamin C and with vitamin D as previously indicated in viosterol or sunshine. Vitamin D is apparently a *sine qua non*.

According to Toverud's experiments a positive and highly needed mineral balance can be assured to the pregnant and lactating woman if she adds to her regimen a pint or more of milk daily with fresh fruits, eggs, cheese, vegetables, and viosterol. A quart of milk and  $\frac{1}{4}$  pound of cheese, says Bernheim.

Another calcium reaction not hitherto noted in the literature though possibly known to dermatologists may be mentioned. In several instances winter itch, a widely prevalent disorder, as well as bath and pudendal pruritus have disappeared when calcium absorption has been stimulated for other symptoms.

The Boyle and Drain and the Mellanby reports on cereals are a distinct contribution to infant feeding and adult nutrition which must not be overlooked.

Incidentally it would appear not only that bacteria cannot be the destructive factors in caries but also that mouth washes, antiseptics, powders, tooth pastes, and similar agents have no value beyond the temporary comfort conferred and a deceptive sense of security since the mouth and gums cannot under any circumstances be made germ-free during life.

Finally we must conclude as Cantarow says in his introduction, "that the subject of calcium metabolism occupies a position in current medical literature comparable to that of carbohydrate metabolism of some years ago."

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#### REFERENCES

- Agnew*: J. Am. Dental Assn. 20: 193, 1933. *Anderson*: Brit. J. Exper. Path. 13: 182, 1932. *Bar*: Lecons de Path. Obst. Paris, 1907. *Becks and Ryder*: Arch. Path. 12: 358, 1931. *Bernheim*: J. A. M. A. 100: 1933. *Boyd and Drain*: quoted by Mellanby. *Brooker*: Dental Survey, December, 1932. *Bunting*: Dental Survey 6: 22, 1930. *Cantarow*: Calcium Metabolism and Therapy, Philadelphia, 1931, Lea & Febiger. Has an excellent bibliography to date of publication. Quoted from Cantarow are Mitchell, Drennan, Kehrer, Lopez, Drain and Nelson, Hadley, Jay and Head, La Mer and Chown, Mazzacco and Sherman. *Cole*: Nebraska M. J. 16:

476, 1931. *Dalldorf*: J. Exper. Med. 53: 289, 1931. Editorial, J. A. M. A. 96: 2038, 1931; J. A. M. A. 95: 1930. *Enright, Friesell, and Trescher*: J. D. Research 12: 759, 1932. *Falta*: Ductless Glandular Diseases, 1916, ed. 2, Blakiston's Son & Co. *Givens and Macy*: J. Biol. Chem. 5: 34, 1922. *Hanke*: J. Nutrition 3: 433, 1931. *Howe*: J. Am. Dental Assn. 2: 1149, 1924. *Hawkins*: Dental Survey, February, 1931. *Johnson, C. N.*: Personal communication. *Jones, Larsen, and Pritchard*: J. A. M. A. 99: 1849, 1932. *Krebs and Briggs*: AM. J. OBST. & GYN. 1923. *Major, Ralph H.*: Chem. Med. pp. 517-521-522. *Mellanby*: Brit. M. J. 1: 677, 1930; J. A. M. A. 96: 325, 1931; Bull. Hyg. 6: 726, 1931. *Milton*: quoted by Hanke. *Noyes*: Dental Research, December, 1932. *Richardson*: Illinois M. J. 59: 453, 1931. *Thomas, Earle H.*: Personal communication. *Toverud*: Brit. J. Child's Dis. October and December, 1931.

## FIVE HUNDRED WOMEN WITH SERIOUS HEART DISEASES FOLLOWED THROUGH PREGNANCY AND DELIVERY\*

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THE cases furnish, in our opinion, especially satisfactory material for analysis since many of the avoidable confusing factors in reports on heart disease with pregnancy have been eliminated. One of us has been in continuous charge of the Clinic since it began twelve years ago, and three other physicians have assisted continuously for shorter periods. Thus the same standards have been used for diagnosis and classification. No patients have been rejected from the Clinic so the series is truly consecutive.

During the period that these 500 cardiac cases were treated, 45,069 patients were delivered. Patients then with seriously damaged hearts amount to 1.11 per cent of the total hospital clientele. When the Clinic started, the percentage was 0.65; of late years, it has risen to 1.5 per cent. The rise has probably been due to increasingly careful examination of the hospital clientele and because the cardiac clinic has naturally attracted some patients with heart disease who would not have gone to the hospital if they had had no heart disease.

The following data give the numbers and percentages of the different types of heart disease found in the 500 cases:

Rheumatic heart disease	472	94.4%
Congenital heart disease	12	2.4%
Miscellaneous	16	3.2%

The 16 miscellaneous cases included 4 with serious heart changes associated with chronic hypertension, 3 with serious heart disorders due to thyroidism, and 2 with bacterial endocarditis. Two had such frequently recurring attacks of paroxysmal tachycardia that they

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were included among the cases judged to have seriously damaged hearts. The remaining 5 cases showed serious heart damage which could not be clearly classed as congenital, acquired or if acquired as to etiology. A small number of such unsatisfactorily grouped cases is unavoidable. No cardiovascular syphilis cases appeared. No cases of coronary artery disease or with the symptom angina were in this series. It is possible for both these last conditions to appear in women young enough to bear children but evidently they appear very rarely. One patient, not in this series but observed by us, with rheumatic heart disease, mitral stenosis, aortic regurgitation and stenosis had the symptom angina from the seventh month until delivery. She survived pregnancy, but was forced to spend the last five weeks in bed.

The twelve congenital heart defect cases were diagnosed as follows: interventricular septal defect 5; patent ductus arteriosus 2; coarctation of the aorta 1; congenital heart anomaly not identified 4.

The following data analyze the 472 cases with rheumatic heart disease:

Uncomplicated mitral stenosis	364	77%
Mitral stenosis and aortic regurgitation	54	12%
Mitral stenosis and aortic regurgitation and aortic stenosis	3	1%
<i>Total number</i> with mitral stenosis	421	89%
Uncomplicated aortic regurgitation	13	3%
Rheumatic heart disease without clear valve involvement, namely with clear enlargement and a probable rheumatic history and with or without a systolic murmur, but with no diastolic murmur	38	8%

Mitral stenosis is then overwhelmingly the most common lesion.

The diagnosis "mitral regurgitation" has not been made. Patients with a rheumatic history and a systolic murmur and no other finding of importance were not considered to have seriously damaged hearts and were not included in this group. Standard classification is highly important in valuing heart complications of pregnancy. These 500 cases were selected from at least four times as many cases referred to the cardiac clinic. With a looser classification which would include the doubtful cardiacs, more than twice as many could have been listed. Only those rheumatic heart disease patients who had unmistakable diastolic murmurs, or a definite enlargement of the heart were included. None of the excluded patients developed heart failure or important cardiac complications during the course of pregnancy, and none of them died of heart disorders. If they had been included, our failure and death percentages would have been much diluted.

The 472 patients with hearts severely damaged by rheumatic disease were distinctly chronic cases. It is the custom to divide rheumatic heart disease patients into active and inactive cases. When we



first studied this problem, we were much concerned to determine how much of a factor in prognosis activity of the cardiac pathology might be. In younger groups with rheumatic heart disease, activity of rheumatic manifestations tends to recur again and again and forms the greatest problem in treatment and the biggest single factor in prognosis. It is commonly known that when a child or adolescent dies of rheumatic heart disease, there are nearly always active manifestations of the disease in the heart. Though rheumatic disease may make its first appearance at any age, the tremendous majority of cases first appear in childhood or adolescence. This adult group is composed largely of individuals who first had rheumatic disease in childhood, and it is extremely interesting to find that active manifestations of the disease have almost entirely ceased to appear. In 472 cases, observed on the average for a year, constituting 472 years of rheumatic heart disease in adult women, only three cases showed evidence of activity. One had chorea which may not have been of rheumatic origin. Another had an acute polyarthritis, considered to be rheumatic fever. The third had pleurisy with effusion suspected to be of rheumatic nature.

These findings make clearer the picture of rheumatic disease itself in the community.

The 500 cases had the following serious complications before delivery:

Hypertension	48	9.6%
Auricular fibrillation	14	2.8%
Paroxysmal tachycardia	7	1.4%
Congestive heart failure	96	19.2%

*Hypertension.*—Those who were found to have repeated readings of more than 140 systolic pressure are included in this group. This is somewhat low to call hypertension. But it has been shown that a blood pressure continuously higher than 140 deserves consideration in pregnancy, so this forms a natural standard. Two of these 48 patients had nephritis. One had had a nephrectomy. Thirty-four cases altogether were considered to have some degree of toxemia of pregnancy, 6.8 per cent of the 500 cases. Five per cent of the whole pregnancy clinic is treated for some degree of toxemia. Unmistakable cases with essential hypertension appear rarely among pregnant women. We have tried to select a group of cases large enough to discuss profitably that clearly belong under this heading, but difficulties of excluding toxemia as a factor in producing the symptoms have been too great and our series is as yet too small to discuss. One can say that among cardiacs in pregnancy the symptom hypertension, usually of mild degree, occurs somewhat more commonly than among pregnant women with sound hearts.

It is of interest to note that only 14 of the series had auricular fibrillation. It has been suggested, in particular by Sir James MacKenzie in his splendid pioneer book on *Heart Disease and Pregnancy*, that the presence or absence of auricular fibrillation is a primary factor in estimating the risk that a patient with mitral stenosis encounters in undertaking pregnancy. And, indeed, in our experience, patients with auricular fibrillation have proved worse risks than those with a normal rhythm. Six of the 14 cases of auricular fibrillation occurred among 32 fatal cases. Therefore, 18 per cent of the fatal cases had auricular fibrillation, while only 2.8 of the total 500 cases had it, and 43 per cent of the patients with auricular fibrillation died. But the incidence of auricular fibrillation in these 500 cases shows it to be much less common and therefore a much less generally important factor in estimating risk than might be supposed. There is no doubt about the association of mitral stenosis and auricular fibrillation in general. Patients with mitral stenosis are considered, and rightly, to be particularly susceptible to the development of auricular fibrillation. Furthermore, strains, such as anesthesia and operation or direct physical exertion (and labor should be classed as a severe physical exertion) are particularly apt to mark the onset of auricular fibrillation in susceptible hearts. Typically and correctly, the adult patient with mitral stenosis and congestive heart failure is pictured as having auricular fibrillation. The failure and fibrillation often coincide. But 96 out of this series had clear congestive failure and only 14 had auricular fibrillation. The only explanation seems to be that the age of the patient is a bigger factor in producing auricular fibrillation than was realized. These patients are not old enough to have heart muscle particularly susceptible to auricular fibrillation, even though they have severe localized heart damage from rheumatic disease.

To confirm this, the average age of the 14 patients with auricular fibrillation was four years higher than that of the total 500 cases. Furthermore, the individual ages among the 14 cases with auricular fibrillation are more significant than the average age of the group; one fifteen and one eighteen years brought the average down markedly. there were only 3 in the twenties (26, 26, 29). There were 6 patients (43 per cent) thirty-five years or older.

The rarity of auricular fibrillation in this group is so contrary to what any physician, especially familiar with patients with mitral stenosis, particularly the disabled cases, would expect, that it shows the value of studying an unusually long series of cases in order to censor preconceived ideas, however strongly such ideas seem to be founded on probability. No cardiologist, for example, would expect

to find more than twice as many patients with mitral stenosis in pregnancy needing treatment for toxemia as needed treatment for auricular fibrillation; 34 were treated for toxemia; 14 for auricular fibrillation.

Paroxysmal tachycardia occurred seven times in the 500 cases. In one case, a woman who had mitral stenosis, an attack of paroxysmal tachycardia at the fifth month of pregnancy, was followed by congestive failure and premature labor. The failure became severe and death occurred suddenly, apparently from sudden cessation of the heartbeat. The paroxysmal tachycardia persisted until the heartbeat ceased. Paroxysmal tachycardia can be a dangerous complication of mitral stenosis. On several occasions, in my experience, it has accompanied failure. But, in general, among patients with otherwise comparatively sound hearts, attacks of paroxysmal tachycardia do not make pregnancy dangerous. Probably close to 1 per cent of all pregnant women have had attacks of paroxysmal tachycardia; for some reason there are more in private practice than in the hospital clinic. It is not uncommon for a cardiologist to be called to see or discuss a patient who has suddenly developed a very rapid heartbeat with regular rhythm due to paroxysmal tachycardia on the operating table, during labor, or in the puerperium. Sometimes there are accompanying severe, general symptoms of shock. Such events are perhaps about half as common as cases of pulmonary embolism. If one can be sure that unexpected alarming symptoms are due to ordinary paroxysmal tachycardia, and if the patient has an otherwise sound heart, one can feel reasonably secure. The attacks are nearly always soon safely over. We have, however, seen one young man die apparently just at the cessation of an attack of paroxysmal tachycardia several days after an uncomplicated appendectomy. Postmortem examination showed a normal heart and no cause for death. And we have encountered a few other disturbing cases that indicate that ordinary paroxysmal tachycardia even in patients with sound hearts is not entirely without risk. Nevertheless, the only serious result noted in a wide experience with patients with paroxysmal tachycardia associated with pregnancy is the single fatality in this series described above, and this patient had a coincidently seriously damaged heart. Ordinary paroxysmal tachycardia is not then to be considered a dangerous complication of pregnancy, except when serious heart damage is also present.

Congestive heart failure occurred 96 times in the 500 cases. Before discussing this complication, we call attention to the following list of the more important postpartum complications in this series.

The total number of severe postpartum complications was 69. Of these the following were cardiac complications:

Rheumatic fever	1
Stokes-Adams attack	1
Congestive failure	1
Auricular fibrillation	1
Noncardiac complications	65

There were then only 4 cardiacs who had complications attributable to their heart disease originating after delivery. The 65 remaining complications were of a totally different nature from the antepartum complicating problems. There were, for example, 8 instances of pyelitis, 5 of sepsis, 4 of pulmonary infarctions from embolism, 2 of psychoses, one of acute appendicitis, one of acute salpingitis, one of recurrent pleurisy, 2 of phlebitis, one of postpartum hemorrhage; the remainder were mainly upper respiratory tract infections, wound infections, cystitis, mastitis, and the like.

Only 4 patients showed congestive failure for the first time during delivery. The cardiologic problems then occur before delivery.

One can see from this that if alarming symptoms occur following delivery in a patient whose heart has not failed or developed auricular fibrillation before delivery, and if paroxysmal tachycardia is not present, the chances are that some other cause than the heart must be found to account for the condition, such as a pulmonary infarction or, rarely, a massive collapse of the lung. (This general rule does not apply so clearly to postoperative complications in older groups.) Indeed, this study and our other experience has led us to the working rule that *where heart failure actually does occur, following delivery, in patients who have not had it before, some additional serious complication is back of the failure*; in actual experience, pulmonary embolism, sepsis, pneumonia have been found to be the exciting factors in the few cases where congestive heart failure has occurred among cardiacs for the first time following delivery.

Following is an outline of the cardiac diagnoses of the 32 fatal cases in this series, and the principal causes of death in the fatal cases of the rheumatic heart disease group:

A Rheumatic heart disease		27
Congestive failure	20	
Sepsis	4	
Embolism	2	
Toxemia	1	
B Congenital heart		2
C Hypertensive heart		2
D Bacterial endocarditis		1

To take the least important cases first: One died of *bacterial endocarditis*. Two of the 27 patients with fatal rheumatic heart disease also had complicating bacterial endocarditis, shown at postmortem examination. One other of the 500 patients had bacterial endocarditis but does not appear among the deaths because she miscarried, was discharged to another hospital, and died several months later. Bacterial endocarditis is actually rare in pregnancy, but comparatively important as an occasional cause of death. It is of value to know that patients with active bacterial endocarditis have been reported who have been delivered of healthy babies; so that bacterial endocarditis may not be considered a reason for therapeutic abortion, since the prognosis for the mother is hopeless in any event.

Both of the patients with *hypertensive heart disease* died of congestive heart failure.

Deaths in the *congenital heart disease* cases occurred in a curious manner. To describe sufficiently the handling of congenital heart disease complicating pregnancy requires too long a discussion to include here. But, briefly, we have found in the Boston Lying-in Hospital and in our private cases, first, that those without disability and with a congenital lesion which does not allow for a communication between the right and left side of the heart or the pulmonary artery and aorta, do well; second, that some of those who have a chance for shunting blood from the right to the left side of the heart, such as an interventricular septal defect, or a patent ductus arteriosus, even though they have had no previous disability whatever, may have sudden unexpected alarming symptoms immediately following emptying of the uterus, and may die.

The alarming symptoms are not those of congestive heart failure, but are rapid breathing and rapid heart, without venous congestion. The patients die slowly or quickly apparently of asphyxia and exhaustion. The symptoms are due apparently to the onset or aggravation of a right-left shunt of blood. This change is due perhaps to a sudden release of peripheral pressure following emptying of the uterus. In the cases that we have studied, such events are most apt to occur where cesarean section or internal podalic version have been the methods of delivery. A number of congenital heart cases of the types that allow for a right-left shunt of blood have had serious symptoms following such deliveries, but the patients have stood normal deliveries without serious symptoms. It is possible that we can prevent or ameliorate such serious symptoms by binding the limbs and abdomen immediately after delivery in such cases, thus tending to restore the possibly lowered peripheral resistance which may follow delivery.

It is then possible to select, to some extent, the congenital heart lesions dangerous in pregnancy, to have definite plans for choice of

type of delivery, and possibly to prevent a rare disaster which can be very disturbing when encountered.

The maternal death rate in the 500 cases was 6.4 per cent. Maternal death rate figures in heart diseases with pregnancy seem to us to be meaningless unless explained. Nearly one-half of the maternal deaths in our series were contributed by patients who were referred to the hospital in extremely sick condition because of their pregnancy. They had not been under the care of the hospital, but were emergency cases. The death rate in this clinic, averaging 6.4 per cent actually has fallen from an average of 12 per cent the first few years of the clinic to an average of close to 3 per cent for the last years.

In private practice the death rate has been very low. In fact, there have been no deaths so far among the patients that have been under strict medical-obstetric control from early in pregnancy or before pregnancy, if one excepts two patients who died undelivered of diffuse bronchopneumonia. The fact is clear that maternal deaths among cardiacs in pregnancy can be kept at a very low percentage. It is equally evident that for cases not under strict control, the death rate is high. Basing this opinion on conservative estimations, we believe that one may consider that an obstetric hospital in a community such as Boston, doing good obstetrics and caring for the whole community would have a "natural" maternal death rate of more than 10 per cent for its cardiacs, if the special requirements of the cardiacs were not recognized and treated according to rules which study of this special problem has uncovered.

It is particularly interesting to know that cardiac deaths contributed 15.2 per cent of all the maternal deaths in the Boston Lying-in Hospital in the ten years from 1921 to 1931. Indeed, in the Boston Lying-in Hospital for a four-year period before this study began, 19 per cent of all the fatal maternal cases were cardiac patients.

How can we explain that 6 per cent or less of all women reported in the whole state of Massachusetts as dying in pregnancy or the puerperal state are cardiacs, basing this figure on study of the death certificates? The proportion of maternal deaths furnished by cardiacs is consistently much higher than this in the Boston Lying-in Hospital. In a private hospital in the same community, where the majority of the obstetricians are graduates or members of the staff of the Boston Lying-in Hospital, the percentage of maternal deaths furnished by cardiacs was 32 per cent over an eight-year period. One is tempted to believe that as obstetrics approaches the ideal, the reducible deaths from sepsis, toxemia, bleeding, dystocias, dwindle, and the deaths from chronic intercurrent disease are relatively increased.

## FETAL MORTALITY

This includes every pregnant cardiac patient who comes to the hospital including those who had therapeutic abortions or who miscarried: 500 cardiac mothers produced 416 viable babies; fetal mortality 18 per cent. Fetal mortality in the whole hospital clinic was 1.3 per cent.

Of 32 cardiac cases terminating fatally for the mother, 11 (one instance of twins) left living babies. Eight of the 32 patients died undelivered.

## DISCUSSION

Probably the most significant finding from this study is that the maternal death rate among cardiac patients in pregnancy is capable of being reduced from a naturally high to a comparatively low percentage. This is so evident that we feel that in the great majority of our maternal deaths among cardiacs, the death could and should have been prevented had simple rules been followed.

How does one reduce maternal death rate?

A large factor in the control of maternal death rate is, of course, selection of good risks and interruption or prevention of pregnancy in the bad risks.

How does one select the good from the bad risks?

No generally applicable easy tests such as special effort tests, seem suitable as the main standard for selection.

One can select a group of clearly bad risks. The definite, obviously correct standards for selecting this group are: (1) Congestive heart failure already present. (2) A clear history of congestive heart failure.

Congestive heart failure constitutes a poor response to the effort test that existence itself affords. Though there are other criteria for determining risk, the great majority of the group that has been classed as clearly bad risks by us has been so classified because they have already had congestive heart failure.

Another clear criterion for poor risk is a complication in itself dangerous. Obviously, a severely damaged heart in a patient with an additional dangerous complication is a very poor pregnancy risk. Such dangerous complications are not common. Auricular fibrillation is the only one that is at all common. Tuberculosis, nephritis, hypertension are, of course, very rarely encountered as complications of this 1 per cent of all pregnant women.

Having selected such bad risk cardiacs, they should be permanently prevented from becoming pregnant. In a community, many of the cardiac deaths in pregnancy are supplied by women who have gone, and perhaps in some cases it is fair to say that they have been allowed to go, blindly into pregnancy a long time after they have clearly shown themselves to be almost hopeless pregnancy risks. Indeed, the more

we deal with this problem the more clearly it appears to us that if the community is not specially enlightened by instruction in the dangers of pregnancy for cardiacs, many cardiacs go blindly into disability and death. If enlightened, the same types of individuals will cooperate and avoid disaster. The remaining group, which includes the great majority of women with seriously damaged hearts, cannot profitably be divided into clearly bad and clearly good risks. We can say, however, that recent manifestations of active rheumatic disease contraindicate pregnancy, but not permanently. As we have shown, active rheumatic disease occurs but rarely in association with pregnancy. And we can show one very clear factor that influences prognosis in the group that is not otherwise classifiable as bad risks; namely, the age of the patient.

Those thirty-five or older are twice as likely to fail under the same conditions as those under thirty-five. Age greater than thirty-five

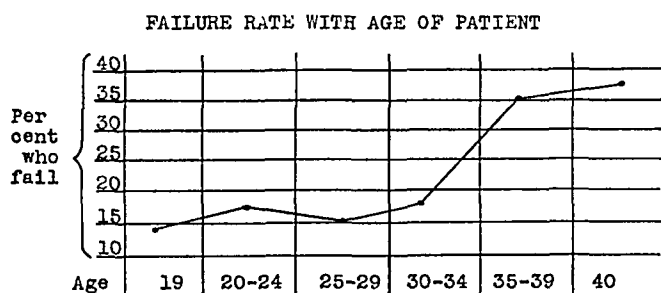


Fig. 1.

alone does not perhaps forbid pregnancy to a patient with severe heart disease, but it doubles the risk, and should indicate a régime even more restricted than the usual régime for cardiacs.

We have found no other clear factors in prognosis in this group of not clearly bad risks. The size of the patient, general poor muscular condition, obesity, anemia, etc., are not expressible in clear terms. In fact, the important thing in the prognosis of the group not clearly recognizable as poor risks is not minor differences in their physical examination, however elaborate the examination, but it is how they are controlled. Following are given in barest outline the rules that we have found most important.

Congestive heart failure is the cause of death in the great majority of the patients with cardiac disease who die in association with pregnancy. Heart failure in pregnancy sometimes creeps on slowly, but very seldom. In the majority of instances, it occurs quickly and as the immediate result (1) of clear overexertion, such as a prolonged shopping trip; or (2) from an intercurrent disease such as a gripe; or, (3) both.

Failure from the first cause can be anticipated by stubborn medical control of the patients: fitting a daily régime to the case, outlining it



specifically, following the patients to see that they observe it, modifying it to the individual requirements. The second big cause of failure ceases to be very dangerous under ordinary conditions if patients can be instructed and convinced that they should go to bed at the onset of any illness, such as a cold and stay there until well. Nearly all women have some kind of a cold or grippe during pregnancy. If the patients with cardiac disease go directly to bed at the onset, as a rule nothing happens. If they stay up and around on their usual régime, some fail.

Clear instruction should be given about dangerous subjective symptoms, such as hemoptysis, or cough on exertion, and adequate warning given that the patient should report them at once since they may mean a failing heart.

Weekly visits and examinations should be the rule whether apparently needed or not.

The first signs of failure should be recognized. The earliest reliable sign of failure is still, in our opinion, persistent râles at the lung bases. It is here that controversy is provoked. Do effort tests or vital capacity determinations serve a useful rôle in predicting imminent failure? In our opinion, they do not. Undoubtedly, clinical observations of the respiration, heartbeat, pulse, color, and general appearance of a patient with whose condition one is familiar, frequently suggest that pregnancy is becoming a dangerous burden before actual failure appears. And a rest or greater restriction of activity is ordered on the general impression that the examination gives. But we have been unable to discover useful rules of thumb to express the results of such examination. It is, however, clear that when patients do fail, it is almost always very easy to know why; they have broken the rules of their régime. Emphasis, therefore, should not be placed on minor and indefinite observations on the patient's condition, or on observations based on tests of questionable value but should be placed on the details of the patient's régime, and on insistence that she follow the details faithfully.

Hospital or hospital conditions until delivery if failure occurs is an absolute rule. This is the most important single rule, in our opinion, and one that is often broken.

These are the fundamental rules on which one bases individual care for each patient. It seems clear in reviewing the work of the clinic since it began, that when the cardiologists recognized the importance of these rules and became active in enforcing them, the death rate fell.

The method of delivery and anesthesia are chosen individually at consultation with the obstetrician and cardiologist.

The fact that cases with severely damaged hearts almost never show for the first time congestive failure or serious symptoms attributable to the heart during or following delivery, suggests clearly that the most important factor in success is to bring the patients with cardiac

disease to the time of delivery in good condition, but it also suggests that the cardiacs in this series have had excellent obstetric care; and that the credit for successful cases is not entirely the property of the cardiologists.

In spite of all these statistics on bad risk cardiac patients, it is impossible for us to deduce and support by statistics at present a useful list of indications for choice of anesthesia and methods for delivery. The multitude of factors requires that each case has to be considered individually.

Certain indications seem to stand out clearly however. Patients with cardiac disease do not have any shorter labors than do normal people. The reason for the somewhat widespread belief that cardiac patients have short, easy labor is hard to guess. It cannot be based, so far as we can see, on any reasonable physiologic speculation. Dr. Bristol Nelson of the Boston Lying-in Hospital has studied a long series of cases to determine whether the length of labor in patients with severely damaged hearts is comparatively short, and he has found that they have no shorter labor than do unselected patients with normal hearts.

It is certainly not always possible to predict whether a given cardiac patient will have an easy or hard labor. Therefore, cardiac patients who are believed by the internist to be bad prospects for prolonged labor and those who are definitely in failure, are usually delivered by cesarean section. One hundred and one out of the 500 cases were thus delivered. This seems like a high figure, but the group is composed of dangerously sick patients. Following are the indications:

Delivered in acute failure	2
Congestive failure	40
Cardiacs thought to be poor risks though showing no definite evidence of failure	25
Total performed entirely for cardiac indications	<hr/> 67
Toxemia	7
Prolonged first stage with little or no progress	6
"Repeat cesareans"	8
Unengaged head	3
Miscellaneous indications	10
Total performed chiefly for obstetric reasons	<hr/> 34
Total	<hr/> 101

The miscellaneous indications included: obstructing fibromyoma, elevated blood pressure with albumin (not classified as toxemia), breech with a previous upper respiratory infection, placenta previa, secondary anemia, bleeding, partial separation of the placenta, previous labor hard terminating in stillbirth.

The patients who are allowed to go into labor are routinely delivered at full dilatation. The obstetrician makes a point of being prepared to start delivery immediately at full dilatation, feeling that the few minutes of second stage that can be saved by being scrubbed and ready to operate can save the patient's heart considerable strain.

Fig. 2 shows the incidence of the onset of heart failure in the months of pregnancy.

It would be very desirable, from the cardiologist's point of view, if some of the patients who are bad risks, but who have not yet failed, but who are close to term could be induced to go into labor by some easy method. Many of the patients who fail in the seventh and eighth months are promptly improved and then have to wait until term or have an operative delivery. An unnecessary prolongation of pregnancy is not desirable from the cardiac point of view. Some sink into failure again while waiting delivery. But no desirable, reliable method has been devised. The temptation, if this is a fair word, to resort to cesarean section in these cases is evident.

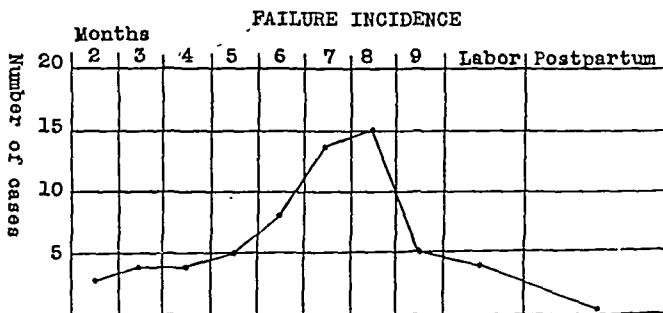


Fig. 2.

Choice of anesthesia in the bad risk cases is based on the following beliefs; all drugs to induce anesthesia administered by mouth or parietally, except by inhalation, are open to some objection. The obvious objection is that the dose cannot be estimated accurately to fit all cases. We believe such drugs are usually contraindicated for severe cardiac cases. Experience has shown that, not uncommonly, where bad risk patients fail to survive, they die a few hours after delivery while still unconscious. If one has given anesthetic drugs by mouth or injection, the picture is clouded and one wishes they had not been given. One cannot tell how much of the collapse is due to the persisting anesthetic drug action. Therefore, experience has tended to make us prefer inhalation anesthesia with or without local anesthesia. Ether is an excellent anesthetic for cardiac patients, when skillfully given; so is gas oxygen. Our own preference is for one or the other of these without preliminary medication and with local anesthesia, if this is indicated. Ether, at present, is not given to patients with premature babies on the recommendation of Dr. Clifford, pediatrician.

In several fatal instances, bad risk patients have been in an excited condition before an operation which could have been postponed. Where possible, when the time for operation is a matter of choice, bad risk patients should be visited by the internist just before the operation, and if any undesirable conditions, which may be treated have appeared, such as nervousness, or fatigue from a restless night, or if congestive failure has appeared as it may at any moment for the first time, the operation should be postponed until these conditions have been corrected. We desire to emphasize again the need for individual care of bad risk patients in distinction to routine treatment. For the control of the average cardiac patients in failure, or close to failure, direct implicit instructions and encouragement given to patients in the presence of the nurse are, in my opinion, far more valuable in inducing the patients to keep at rest than any system of drugging, however carefully planned.

### DISCUSSION

DR. B. P. WATSON, New York.—As in the Boston Lying-In Hospital, so in the Sloane Hospital for Women, we make special provision for cardiac cases. A ward is set apart for them and we have special antenatal and postnatal outpatient clinics for the study and follow-up of the cases, by internists. The members of the obstetric staff depend upon the internist for the diagnosis and treatment of the cardiac complication. They discuss with him and carry out the appropriate obstetric procedure. I am convinced that it is only by such close cooperation between internist and obstetrician that the best results will be obtained in the investigation and treatment not only of cardiac disease in pregnancy but also of that large group of patients classed under the general term pregnancy toxemia.

The following comparative statements should be of interest.

	CASES	DELIVERIES	PERCENTAGE
Boston Lying-In Hospital	500	45,069	1.11
Sloane Hospital for Women	240	18,800	1.3

Similarly in the percentages of the different types of heart disease:

	<i>Boston</i>	<i>New York</i>
Rheumatic heart disease	472, 94.4%	229, 95.4%
Congenital heart disease	12, 2.4%	3, 1.3%
Miscellaneous	16, 3.2%	8, 3.3%

Then again in the percentage of the different lesions in the rheumatic cases:

	<i>Boston</i>	<i>New York</i>
Mitral stenosis	364, 77 %	160, 69 %
Mitral stenosis and aortic regurgitation	54, 12 %	37, 16.1%
Mitral stenosis and aortic regurgitation and stenosis	3, 1 %	3, 1.3%
Total number with mitral stenosis	421, 89 %	200, 87 %

When two clinics organized in the same way, but working absolutely independently, get such similar figures in a series of 740 cases, 500 in one and 240 in the other, I think we are justified in concluding that we are getting somewhere near the truth.

Our internists are in agreement with Dr. Hamilton regarding the relative infrequency of auricular fibrillation in the pregnant woman with rheumatic heart disease, and the relative frequency of congestive failure without fibrillation. We are in

general accord with Dr. Hamilton when he says that congestive failure is not likely to occur following delivery if it has not occurred antenatally; although we have seen patients who, within forty-eight hours of delivery, showed alarming symptoms such as orthopnea, palpitation, and cyanosis.

We most heartily endorse what he says with regard to the therapeutic value of complete and absolute rest in bed whenever there is the slightest sign of decompensation. The average period of hospitalization of our patients with mitral stenosis was thirty-two days, and of mitral stenosis and aortic insufficiency thirty-six days.

In the city of Greater New York in a three-year period there were 99 cardiac deaths associated with pregnancy, constituting 4.6 per cent of the total maternal mortality. Excluding deaths from abortion and from ectopic pregnancy the percentage of cardiac deaths to the total maternal deaths is 6.3 per cent, practically the same as Dr. Hamilton has found in Massachusetts and in the Boston Lying-In Hospital. On making an analysis of the individual fatalities, it is found that only 41.4 per cent of the patients who died had adequate prenatal care, while 56.6 per cent had inadequate care, or no care at all. Of our 17 cardiac deaths in the hospital, 8 were emergency admissions, the patients having had no adequate prenatal care. Three of these patients died undelivered, 3 within five hours of delivery, one two days after, and one fourteen days after delivery.

If as the result of this meeting it could be broadcast to the physicians of the country that rest is an essential for the pregnant woman with heart disease, we would be doing a great deal to lower maternal mortality from this cause.

Our two clinics differ in the method of delivery. In the Boston Lying-In Hospital the cesarean section rate is 20.2 per cent of all cases, while in the Sloane Hospital for Women, it is 9.16 per cent. In our series there were 22 therapeutic abortions performed and 20 hysterotomies with sterilization, a total of 42 early terminations or 18.3 per cent. Only 4 patients aborted spontaneously. Dr. Hamilton did not state what percentage of his patients had pregnancy terminated in the early months.

It may be that our cesarean section rate is lower because we terminate more pregnancies early than does the Boston clinic. When we abort a cardiac patient it usually means that not only do we consider it dangerous for the pregnancy to continue but that future pregnancies are contraindicated. If the patient can be depended upon to carry out contraceptive advice, the uterus is emptied from below. If it seems unlikely that she will be able to do so, we advise her to have an abdominal hysterotomy and sterilization. The same argument holds with regard to cesarean section. A patient who requires a cesarean section for heart disease should not undertake another pregnancy. So in 17 of our 22 cesarean sections, tubal sterilization or hysterectomy were performed. We are loath to do a cesarean section in a cardiac patient unless consent to sterilization is given.

It is our experience that cardiac patients take inhalation anesthesia, especially open ether, well. We do not use gas oxygen, and, like Dr. Hamilton, we avoid the use of any form of anesthesia which we cannot absolutely control, such as pernocton intravenously or avertin per rectum.

One hundred and two of our patients were delivered spontaneously, 45.5 per cent; and 49 had forceps extractions, 20.41 per cent.

We have not followed our patients in sufficient numbers or sufficiently long to have any real facts regarding the remote effects of pregnancy and of the different types of delivery. It may be that we are allowing too many pregnancies to proceed and are doing too few cesarean sections. I know that I do fewer now than I did ten or fifteen years ago, but now with increased hospitalization we see fewer patients in a serious condition at the time of labor. So far as our follow-up goes, it shows that of the 223 patients who left the hospital alive, 31, or 13.9 per

cent, have since died. Nine died in the first year following delivery, six in the second, three in the third, five in the fourth, three in the sixth, two in the seventh, one in the eighth, and one in the ninth year. Adding to these the 17 deaths which occurred in the hospital this gives a total of 48 in the 240 cases over a ten-year period, a mortality of 20 per cent. How this figure compares with the mortality in a similar group of cases in which pregnancy and labor had not been a factor I do not know. This information is necessary in order to form a true estimate of the risk which pregnancy imposes on the woman with heart disease.

A 20 per cent mortality over a period of ten years does not seem high for the type of case with which we are dealing. It would be indeed interesting if further statistical study were to show that the care and attention given in our clinics to the pregnant patient with heart disease more than offset the strain of pregnancy and labor. But now we are getting into the realm of speculation and had better stop.

DR. DANIEL LONGAKER.—The plea that MacKenzie is out of date, outlawed by later knowledge of the dangers of chloroform, is negated by the advice of Sir Thomas Lewis, in his recently published book, *Diseases of the Heart* (The Macmillan Company, N. Y., 1933, P. 273), in which he too endorses chloroform in the cardiac, by saying that "Chloroform is well taken."

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## TRAUMA AND COMPENSATION IN GYNECOLOGY AND OBSTETRICS\*

JAMES RAGLAN MILLER, M.D., HARTFORD, CONN.

"THE industrial world is filled with great medicoeconomic and medicolegal problems whose solution depends primarily on the assistance of the leaders in the medical profession." The solution of these problems has been left "to the unscrupulous lawyer and to the even more unscrupulous professional medical expert witness."

Conditions have changed little since H. E. Mock made the above statements, for the basic conditions under which medical testimony is given in this country still place the physician in the position of presenting only that part of the truth which his side in the controversy desires. Until the European system of court appointed and court paid experts is adopted, we may not expect the best element of our profession to do other than try to avoid this branch of practice. I believe this consideration to be so fundamental that I should urge our medical organizations to work toward the establishment of a system of impartial experts. This will gradually draw in the highest and weed out the lowest type of physician.

You are all familiar with the changes that have been brought about by industrialization and by the automobile. The demands of insurance coverage of each of these of these groups, in compensation work and in accidents, have outgrown the profession's ability to meet the situa-

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\*Read (by invitation) at a meeting of the New York Obstetrical Society, March 14, 1933.

tion in a satisfactory manner. It goes without saying that correct diagnosis and skillful treatment are of prime importance, but prognosis, as such, is subjected to remorseless scrutiny and the skill or absence thereof is quickly known to the insurance carrier in terms of greater or less cash awards for damages. Nowhere in medicine is there a greater need for accurate prognosis, and incidentally, nowhere are the rewards greater for one who can forecast the future condition of a patient.

Since insurance carriers and society at large have little protection against fraudulent and unnecessary medical practice, except the integrity of the profession, it behooves us to encourage the honest physician to enter this field, and by study of the fundamental facts on which prognosis is based to make it more difficult for the ill-trained or unscrupulous expert to convince courts by false testimony. Changing fashions of diagnosis are often costly to society. Formerly, more easily than today, damages were collected on a basis of visceroptosis, displacement of the kidney, and coccygodynia. The rarity of traumatic retrodisplacement of the uterus is becoming so well understood that awards are less frequently made, though it still has a distinct "nuisance" value. Even "traumatic" hernias are becoming less of a problem.

Separation of the symphysis, so well reviewed by Boland, has more significance in malpractice suits, but we may look for accident claims of this nature as well. Boland found that normal deliveries were more productive of separation than other agents of trauma. According to DeLee, a force expressed as 400 to 2600 pounds is necessary to disrupt the pelvic girdle, and therefore some inherent weakness must be present in cases where such force is not exerted. Boland feels that correction of the gaping of the pubic and sacroiliac joints is essential for functional results, and cases previously separated will separate again in succeeding pregnancies.

One of the most troublesome conditions in the whole field of accidents in women is the automobile fracture of the pelvis. These patients claim all kinds of symptoms, derangement of function, and usually the total loss of powers of procreation. The story of present and future suffering is made so dramatic that large awards of \$5000 to \$25,000 have been extracted from sympathetic juries, in cases where an impartial estimate could scarcely justify such sums.

So great is this factor that one insurance company official expressed it as follows: "If we could eliminate the awards for female fractured pelvis, we could decrease liability insurance premiums by at least 10 per cent." Let us remember that we all are automobile owners, and are in this way paying indirectly for many fraudulent claims.

What are the facts about fractured pelvis?

1. Fractured pelvis as a rule require six weeks in bed, and should be completely well in three months. Though we are interested here in considering the actual injuries, we must realize, however, that many symptoms persist until the suit is settled. It is well to recall the experience abroad where it is statistically proved that a broken leg takes one week longer to heal in Germany than across the border in Switzerland, the explanation being found in the cash allowances in the different countries.

2. Deformity may be caused by faulty bony union, or callus formation may temporarily diminish the available space in the pelvis so that dystocia may result. This may necessitate cesarean section, and on this basis awards may be justified, but not for complete sterility.

3. The degree of bony abnormality can be quite accurately demonstrated by the Thoms method of pelvimetry, and there is no excuse for inability to render an accurate prognosis as regards future labors. It is to be remembered that two statements are required: (1) What are the changes? and (2) Do these changes lessen the ability to deliver normally? As an example: A patient three months before term in her second pregnancy sustained a fractured pelvis. She continued her pregnancy and was delivered easily by low forceps. She later claimed damages on the basis of impairment of function in future pregnancies and recovered \$4500 damages. The insurance surgeon pointed out to me that accurate Thoms pelvimetry and other refinements of diagnosis are generally not allowed by the plaintiff for fear that the findings may prejudice her claim, as indeed they might. In this case the award was probably justified on the basis of the suffering caused, and the expenses of treatment, but there was no justifiable claim because of future dystocia.

We need more records of labors subsequent to fractures of the pelvis so that we may have a broader background of experience to go on.

Claims as they are seen by the accident surgeon fall in the order of frequency into the following groups: (1) Alteration of uterine bleeding, (2) retroflexion, and (3) interruption of pregnancy.

*Alteration of Uterine Bleeding.*—The laity is aware of the causal relationship of accidents, excitement, fear, and anxiety in altering the regularity of the menstrual flow. Crafty lawyers can make up a case with the greatest ease. Damages in this type rarely amount to large sums, but their frequency and their nuisance value demand a clearer definition of the problem.

Since the causal relationship as regards time is often quite clear, and since the mental upset is by far the most expensive element in the suit, it is often the wisest course to admit the causal relationship and lessen the anxiety of the patient and her family by giving an absolutely favorable prognosis. One should advise strongly against curettage, and with rest, promise a complete recovery of normal menstrua-



tion in two to three months. One should bear in mind the amenorrhea which occurs with change of climate alone and which may occur in a patient who has sustained an accident. Claims have been made in such cases.

We may begin to look for claims on the basis of injury to the corpus luteum causing intraabdominal hemorrhage. Such cases have been considered by Greenhill, Sackett, and others. We know that severe hemorrhages, requiring laparotomy, may occur spontaneously or after bimanual palpation. Rukstinat, however, has reported hemorrhage into the ovarian stroma in a thirty-eight-year-old woman who died of cardiac decompensation where no trauma was concerned. From a theoretical point of view, we may consider it likely that trauma may cause enough disturbance to the graafian follicle or corpus luteum to account for many of the irregular menstrual disorders which are now seen following accidents, and which are inadequately explained on the basis of overwrought "nerves." It is curious that most of these patients are thin and neurotic. A clearer conception of this class of cases is needed, but from an insurance point of view, the prognosis is good for disability of not over two to three months, and for little or no discomfort other than that due to anxiety.

*Traumatic Retroflexion.*—Raaflaub gives one of the best reviews of the subject which I could find in the literature. He agrees with Mayer that a definitely proved traumatic retrodisplacement has never been observed in a nulliparous woman whose pelvic organs had been normal prior to the accident. Even though this be so, in insurance work such a statement has scarcely more than academic interest, for Fritsch, Mock, Sims, and others have shown that following a suitable injury, symptoms can be produced which can be explained only on the basis of retrodisplacement. Whether this condition followed a previously normal pelvis or one in which predisposing factors existed cannot be established with more than a certain degree of probability, since the uterus is a movable organ and alters its position in the normal woman.

Raaflaub believes that the correct attitude to take, in consideration of the rarity of traumatic retrodisplacement without definite predisposing factors, should be to hold these predisposing factors partly responsible for the damage caused. He gives four requisites for establishment of the claim of traumatic retrodisplacement.

1. Prior to the accident the patient must have been fully able to work.
2. The trauma must have been of a nature and of an intensity sufficient to cause retrodisplacement.
3. On examination, the findings must correspond to a recent violent retrodisplacement; especially must the uterus be movable.
4. Symptoms must be strikingly relieved by replacement of the uterus.

Raaflaub has never seen a permanent retrodisplacement following trauma unless it was there before. He gives the period of disability as three to ten days on the basis of authenticated cases. This estimate is further attested by Kelly, Mock,

von Herff and Tillaux. Prolonged disability due to traumatic retrodisplacement does not exist on the basis of pelvic injury alone. The practical problem for the court, in view of predisposing causes, is to determine to what extent function has returned to that which obtained before the accident. The predisposing factors which should be looked for on examination are:

1. General constitutional:
  - (a) Asthenic constitution
  - (b) General infantilism
  - (c) Neuropathic constitution
2. Local:
  - (a) Constitutional:
    - (1) Partial genital infantilism
    - (2) Spina bifida
    - (3) Diminished pelvic inclination
  - (b) Acquired:
    - (1) Birth injuries, prolapse, etc.
    - (2) Chronic inflammation
    - (3) Tumors, especially ovarian

Raaflaub reports five cases of his own in two of which, these being the most undisputed in character, there was marked tenderness in both inguinal regions. He believes that this inguinal tenderness is usual in all traumatic retrodisplacements. This idea was heartily endorsed by H. Futh.

We may therefore say that traumatic retroflexion is very rare, but does occur. When found, it is always acute, occurring immediately with violent and prostrating symptoms of extreme pain, local swelling and tenderness in both inguinal regions, as well as on palpating the uterus. Immediate relief follows manual replacement, which sometimes requires an anesthetic. This rare condition usually occurs in the presence of a full bladder. One should always look up previous pelvic examinations for evidence of preexisting displacements, and should note the stigmas of congenital retrodisplacement. Such facts are interesting confirmatory evidence, but the case for traumatic retrodisplacement must rest on the acuteness and violence of the symptoms and their relief on replacement of the uterus.

*Interruption of pregnancy.*—The effects of violence on pregnancy at any period cannot be denied. In this class of cases the search for the truth requires real detective skill. Evidence of bleeding prior to the accident, of habitual abortion and gonorrhea in the early months, and of syphilis or nephritis in the later months, must be uncovered, if present. The value of carefully recorded pelvic findings prior to the accident is easily appreciated, and previous notes and hospital admissions must be looked up. We have repeatedly urged our house officers to write up their notes in each case as if they were to be the turning point in some future lawsuit. This argument has a great appeal to young physicians, especially when they have once experienced the discomfiture of presenting a poorly recorded history in court. I believe the pedagogic value of this approach to history writing is not fully

appreciated in our teaching institutions. One never knows when his office notes may be the subject of valuable testimony.

Wherever there is an accident involving pregnancy, the careful examiner will never fail to make his examination as early as possible, and record the blood pressure, urine, and Wassermann reactions; and he should urge in his report the necessity for subsequent prenatal observations.

D. M. Lindsay has covered the whole subject of this paper in an excellent monograph based on a wide experience in Glasgow. Every physician who may be called upon to examine accident or compensation cases would do well to study this valuable contribution. He gives excellent advice on making out the reports, on the methods of approach, etc.

The conclusions of the medical report must be based on history and findings, they must report conditions resulting from the accident, as well as those which are aggravated or are likely to be aggravated by it, and must give an estimate of the period of disability. These conclusions must be logical deductions from observed facts, or reasons must be given for the conclusions.

The report may be used in court, and should be, as far as possible, in simple language free from unnecessary terms. Jurors like to learn medicine but hate to be confused by involved language.

One of the rare injuries recorded by Lindsay is by contrecoup, with which we are familiar in cranial injuries. For example, rupture of the fundus of the pregnant uterus at midterm has been reported due to a fall from a great height, the patient landing on her feet. Similarly, a severe blow on the back of a pregnant woman at term may cause fracture of the infant's skull from impact against the symphysis.

It is hardly necessary, at a meeting of this Society, to list all of the unusual results of trauma, or to emphasize the technic of careful and complete examination. It may be helpful, however, to urge a more thoughtful consideration of the teaching value of many of these cases. Students seem to be especially interested in medical information for which they can see a practical value. It may also be helpful to present the point of view of the insurance carrier, as to what he expects of the examining physician.

The insurance companies tell us that gynecologic cases under the compensation laws are not a problem at present, but those in the accident and liability group are increasing very rapidly. Their only hope lies in the integrity and ability of the medical profession. They want to know (1) Was there an injury? (Causal relationship) and (2) What is it worth? (Prognosis), and it is necessary for the insurance company to know the worst as soon as possible. These two items should be clearly covered in the report with the reasons which lead to the conclusions drawn.

The liability (causal relationship) is either clear or it is not, and if not clear, the physician must give evidence and reasons why it is not clear, as this must often be proved in court. The cardinal findings bearing on the conclusions drawn should be listed specifically.

Concerning prognosis, the insurance carriers realize that this is most difficult, but they say some one has to do it and the physician is better able to make a good prophecy than anyone else.

There is one difficulty which is inherent in the present system, namely: one physician is the patient's and the other belongs to or is hired by the company. The truth often lies between the reports of the two men, and I believe this will be so until some system of impartial examination is set up. To overcome the difficult barrier which often arises between the patient and the company's examining expert, the latter can by the use of tact, and by the assurance that he will tell the patient all that he finds, gain her confidence in his ability and integrity. Under no other conditions should an honest medical expert undertake to examine a patient for an insurance company; the patient's best interest, from a medical and not a financial point of view, must guide him. The company's expert should examine the patient with her physician, and conduct the whole affair on the same high ethical plane that he is accustomed to in private consulting practice.

At the White House Conference the Committee on Vocational Guidance of Child Labor recommended the selection of a committee of experts to consider occupational hazards, and formulate standards for the protection of minors against such hazards. Such a committee met and its report is now published in the *Monthly Labor Review* of the Bureau of Labor Statistics, December, 1932. Though concerned mostly with the occupations of children and adolescents, their recommendations cover a carefully studied list of hazardous occupations which is of use in the consideration of any form of labor which is hazardous to pregnant women or to some extent to women in general.

Child labor legislation has been slow to take into account the peculiar susceptibility of the young worker to accident in occupational disease. Regulations affecting hazardous occupations for women during pregnancy are even less well developed.

The condition in this country is in sharp contrast to that which obtains in some of the European countries and in South America, where socialization of medicine has led to the formulation of detailed regulations in this restricted field. At the end of this paper a few references are given which will be helpful for those who are interested.

Insurance companies are so occupied with major hazards of industry that there has been little attention given in this country to the effect of various occupations on the female genital organs, and I am sure

that among specialists in this field there is little general knowledge of this subject. Some of the experience in foreign countries may be summarized as follows:

1. Long continued sitting position, foot pedaling at sewing machines, prolonged use of the upright position, external factors such as prolonged heat, cold, bad air, and work in awkward positions, increase menstrual disorders.

2. In the pottery trades women are apparently more susceptible to lead poisoning than men, though Hamilton has shown that such susceptibility depends largely upon poorer economic and social factors.

3. Benzene derivatives such as are used in the cleaning of clothing and in the war industries may cause severe and even fatal menorrhagia. All of this group of poisons tend to cause infertility, irregular periods, and even amenorrhea. Nitrobenzol used in the manufacture of leather, oils, polishes, soap, perfumes, etc., is especially dangerous to the blood-forming organs and indirectly to menstruation.

4. The fall of the birth rate in industrial communities has been in direct relation to the number of employed married women, although other factors must be considered.

5. The poisons which pass through the placenta include the alkalis, lead, phosphorus, arsenic, bromine, and chlorate of potash, as well as carbon monoxide. Mercury does not pass through but is stored in the placenta. Phosphorus causes placental hemorrhage and fatty degeneration of the fetal liver. Lead poisoning, especially in the book printing and pottery trades, interferes with procreation at all stages, causing sterility, abortion, stillbirths, premature labor, and constitutional defects of children. The exposure of the father seems to be as dangerous to the fetus as exposure of the mother. The fetal death rate when both parents are exposed is doubly increased.

The only comprehensive review of the relationship of industry to gynecology and obstetrics is found in *Handbuch of Halban and Seitz*, written by Max Hirsch. He has collected much information which most of us would find otherwise inaccessible. May I indicate some of the interesting items in this review:

In cases of lead poisoning involving a stillbirth or abortion, the presence of lead may be discovered in the membranes or in the fetus where lead is a clear-cut cause of trouble.

Children of parents who have had lead poisoning present a shockingly high mortality, and a high incidence of congenital abnormalities. The use of mercury as well as lead in secret abortifacients would suggest that we inquire as to the hazard for married women in the incandescent light industry, and in the hat industry where rabbit fur is prepared with mercury.

Carbon bisulphide, used in vulcanizing rubber, tends to produce abortion, fetal death, sterility, and amenorrhea.

Tobacco workers, especially those who are exposed to tobacco dust, have a high incidence of vulvovaginitis and endometritis. This may not be a hazard in this country, where the closed bloomer commonly worn by our women affords some pro-

tection. Apparently nicotine poisoning stimulates the thyroid activity, and the newborn death rate and abortion rate is high.

The hazards of x-ray and radium are too well known to be more than mentioned.

The above facts which I have gathered from the literature indicate the complexity of the problem. Perhaps the gynecologist has been called on seldom in these cases because gynecologic symptoms have been overshadowed by other more serious symptoms elsewhere in the body. It is hoped that this brief sketch will draw attention to the necessity of our considering the industrial life of our women patients. As specialists, this is an undeveloped and rapidly expanding field which we cannot afford to disregard, for socialization of medicine will force the problem on us.

It has been the purpose of this paper (1) to call attention once more to the increasing importance of injuries to the female genital tract; (2) to emphasize the necessity of recording all unusual traumatic cases, especially labor after a fracture of the pelvis; (3) to point out the teaching value of traumatic cases; (4) to urge the members of this Society to interest themselves not only in the scientific side of the problem, but in developing standards of medical expert testimony in our specialty; and, (5) finally, to arouse interest in those industrial hazards which affect the female generative tract.

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#### REFERENCES

- Bacon*: Railway Surg., September, 1908. *Boland, B. F.*: New England J. Med. 208: 431, 1933. *Burch, L. E.*: South. M. J. 20: 339, 1927. *Fritsch*: Monatschr. f. Unfall. u. Invalid. 6: 27. *Füth, H.*: Halban u. Seitz. Biol. u. Path. des Weibes. Pt. 2. 5: 1033, 1926. *Idem*: Zentralbl. f. Gynäk. 50: 871, 1926. *Gellhorn, G.*: J. A. M. A. 78: 259, 1922. *Gormard, R.*: La Femme dans l'Industrie. *Günner, A.*: Zentralbl. f. Gynäk. 42: 272, 1918. *Gonzalez, J. B.*: La Semana méd. 2: 1294, 1922. *Greenhill, J. P.*: AM. J. OBST. & GYNEC. 22: 902, 1931. *von Herff*: Arztl. Sachverst-Zeitung. 4: 133, 1898. *Idem*: Monatschr. f. Unfall. 5: 204, 1898. *Hirsch, Max*: Halban u. Seitz. Biol. u. Path. des Weibes. 1: 925, 1924. *Hüssy, P.*: Schweiz. Ztschr. f. Unfallk. 17: 11, 1923. *von Jaschke*: Zentralbl. f. Gynäk. 49: 189, 1925. *Küstner*: (In Bumm, E., and Doederlein, A. et als. Kurzes Hdl. der Gynäkologie. 1919). *Lindsay, D. M.*: Trauma and Compensation in Obstetrical and Gynecological Cases, London, 1928. *Hodge. Martin, A.*: Arztl. Sachverst-Zeitg. 17: 389, 1911. *Mayer, A.*: Die Unfallkrankungen in der Geburtshilfe und Gynäkologie. Stuttgart, 1917. *Encke. Mock, H.*: J. A. M. A. 79: 797, 1922. *Molineus*: Monatschr. f. Unfall. 26: 6, 1919. *New York (State) Dept. of Labor*: Women Who Work, Special Bulletin No. 110, April, 1922. *Occupation and Health*: Encyclopaedia of hygiene pathology and social welfare, Brochure No. 152, Geneva, Internat. Labour Office, 1931. *Raaflaub, W.*: Zentralbl. f. Gynäk. 49: 2706, 1925. *Reifferscheid*: Halban u. Seitz. Biol. u. Path. des Weibes. 3: 621, 1924. *Rukstinat, G. J.*: J. A. M. A. 98: 1716, 1932. *Sackett, W. B.*: AM. J. OBST. & GYNEC. 23: 849, 1932. *Tillaux*: Ann. d. Gynec. 22: 405, 1889. *U. S. Bureau of Labor Statistics*: Monthly Labor Review 35: 1315, 1932. *Waegeli, C.*: Gynec. et Obst. No. 3, 1921. See also *Bibliography of Industrial Hygiene*, published by The International Labour Office, Geneva, quarterly since 1926.

#### DISCUSSION

DR. G. W. KOSMAK.—I have occasion through my association with the County Medical Society to see the development of this phase of medicine with which many of us, as specialists are quite unfamiliar. Dr. Healy's reference to certain court procedures are perhaps the more or less old-fashioned way in which the doctor comes

in contact with the law, but the development of compensation work in recent years has put an entirely different phase on this question, because, if this process continues, that is to say, if compensation is merely a step in the direction of a further socialization of medicine, the profession will necessarily be forced into a much closer relationship with this field of practice. It is not only a question of court procedure, it is a question of handling a great proportion of the population through or by methods which have been more or less standardized by legislative procedures and the situation is, in a way, rather a serious one. Through the efforts of organized medicine, the choice of physician of an injured person has been considerably modified, and the patient need no longer rely upon a physician employed either by the insurance company or by an individual employer; there is in most states a free choice of physician. Unfortunately, as has been indicated this evening, the trend is toward the employment or the reference to physicians who are really not particularly qualified to do this work, so that a great many of these compensation cases are made the subject of lawsuits and compensation trials before the State Board of Arbitration because of this lack of competency. I have thought at times that it might be necessary for societies of specialists to establish standards of treatment, and not only to interest themselves directly in the subject, but to participate in the actual treatment of these conditions. Dr. Miller has brought out very effectively in a way that I myself did not realize the intimate relations of a great many of these industrial diseases and industrial accidents to the domain in which we are interested, and I think we should be grateful to him for having brought the results of his very extensive study to our attention, because as time goes on, we are going to be concerned with it more and more, particularly in hospital practice. Many of these patients who used to go to the offices of the private practitioners will no longer go there because their treatment is in charge of state officials and bureaus.

DR. JAMES R. MILLER.—I had two purposes in presenting this paper. When I tried to inform myself upon the subject, I was astonished at the loopholes in our knowledge of the effects of trauma, particularly in the field of prognosis. When I turned to the literature on the relationship of industrial hazards, I found that there is practically nothing in this country. My own state, Connecticut, has done a great deal of work in the industrial field in the study of mercurial poisoning, silicosis, etc. The Department of Public Health of Yale University in New Haven has carried out numerous extensive investigations in this field, and yet both these sources were uninformed on the peculiar relationship of the hazards in the hat industry affecting the female worker. In this industry the workers handle mercury-laden rabbit fur. A practical study in this field is immediately suggested although the problem is a very difficult one. There is tremendous opposition on the part of the industrialists to ascertaining facts, because they often tend to increase compensation rates.

The second object of the paper was to try to interest this Society in the medical testimony procedure which is in vogue in Europe. I found on consulting with our Chief Justice in Hartford, that the legal profession as represented by the Judicial Council of the State, would apparently welcome an approach from the medical profession, and from other professions, such as expert accountants, engineers, etc., to the end of establishing a scheme of court-chosen and court-paid experts, so that we might be rid of the present wrangling with which we are all disgusted. It would seem to me a perfectly logical thing for organized medicine to approach the legal profession and try to bring about this desirable end. He pointed out immediately that experts could not be denied to either party in the controversy, but stated that he relied upon the integrity and ability of the superior court judges year in and year out to select men for this work of such high standing that they, and not the hired experts, would be listened to.

# CONGENITAL ASPIRATION PNEUMONIA IN STILLBORN AND NEWBORN INFANTS

AN ANALYSIS OF 159 NECROPSY EXAMINATIONS

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VERY often only slight attention is given to the necropsy studies of stillborn and newborn infants, dying within the first few hours of life. This is particularly true in regard to routine microscopic study of the viscera. In January, 1928, a systematic necropsy study of all stillborn and newborn infants who died in St. Luke's Hospital was begun. Since that time, in a series of 3,086 births, 159 necropsy examinations have been performed. The placentas were routinely examined and the maternal clinical records were analyzed. In this series, 66 cases, or 41.5 per cent, revealed some degree of pneumonia which in a majority of instances was considered to be an important factor in the death of the baby. Hess-Thaysen, Browne, Johnson and Meyer, Gordon and Lederer, Hook and Katz, Farber and Sweet, and others have all emphasized the remarkable frequency of pneumonia in the newborn. Farber and Sweet, in a series of 124 necropsies in infants, found amniotic sac contents in the lungs in 88 per cent of these cases, while in 15 per cent large amounts were present. Johnson and Meyer saw evidence of pneumonia in 19.5 per cent of 500 necropsies on stillborn and newborn infants wherein they believed that aspiration of amniotic fluid was the most important cause of death. Therefore, a more general recognition of this extremely common condition may stimulate more painstaking and thorough necropsy examinations, which may tend not only to decrease the incidence of unascertained deaths but likewise help to eliminate the all too frequent diagnosis of merely "stillbirth" or "prematurity."

*Etiology.*—The frequent occurrence of amniotic sac contents in the pulmonary alveoli does not necessarily imply that its presence is not pathologic. The most recent investigations on the subject of intra-uterine respiration seem to favor the belief that in utero the normal respiratory movements occur with a closed glottis; therefore, so little suction is present that amniotic fluid reaches no farther than the larynx (Farber). Hence, it may be said that the finding of appreciable amounts of amniotic fluid in the pulmonary alveoli may be distinctly pathologic, and when encountered in large amounts, is possibly of prime importance in causing death by asphyxia. The possible etiology factors responsible for such aspirations are numerous while the



TABLE I

NO. AGE	POSSIBLE ETIOLOGIC FACTORS	ALVEOLAR CONTENTS
1 S*	Massive anemic infarction of the placenta	No purulent reaction; extensive amniotic aspiration
2 6 da.	Cerebral hemorrhage	Hemorrhagic purulent exudate
3 S	Nothing of importance	Amniotic fluid with epithelial cells
4 Few hr.	Cord around neck; mother a cripple; bag induction	Fibrin as well as amniotic fluid present (small amount)
5 Few min.	Premature	Incomplete expansion of lungs; small amount of fluid present
6 S	Fibrosis of placenta (nonsyphilitic)	Amniotic fluid and some fibrin in alveoli (small amount)
7 S	Multiple placental infarcts	Pus cells and amniotic fluid, and fibrin (extensive)
8 12 hr.	Cesarean section; placental infarction	Cornified epithelium; pigmented cells; typical picture (extensive)
9 S	Premature; placental fibrosis (nonsyphilitic)	Fibrinopurulent exudate (extensive)
10 S	Nothing of importance	Scattered foci of aspiration
11 5 da.	Subdural hemorrhage	Amniotic fluid with superimposed acute purulent hemorrhagic exudate
12 2 hr.	Cord tight around neck; strenuous mouth-to-mouth insufflation	All alveoli distended with amniotic fluid (extensive)
13 S	Enormous hydrocephalic	Typical amniotic aspiration (generalized)
14 S	Eclampsia; 17 convulsions day of delivery; cesarean section; placental infarction	Typical generalized aspiration, amniotic fluid
15 Few min.	Posterior presentation; forceps	Extensive aspiration; amniotic fluid
16 S	Congenital heart	Typical aspiration pneumonia (patchy)
17 Few min.	Breech; induced labor; subtentorial hemorrhage	Aspiration of amniotic fluid—typical, patchy
18 Few min.	Right side subdural hematoma	Massive amniotic aspiration
19 14 da.	Difficulty with resuscitation at birth	Areas of amniotic aspiration; confluent bronchopneumonia
20 Few hr.	Premature; nothing else of importance	Extensive aspiration of amniotic fluid
21 Few min.	Dry labor; forceps; spina bifida and club feet; subtentorial hemorrhages	Typical aspiration with alveolar hemorrhages
22 12 hr.	Macerated twin with this child	Typical aspiration with hyaline membrane (aspiration of amniotic fluid)
23 Few min.	Premature	Typical aspiration of large numbers of amniotic epithelial cells; no pus
24 12 hr.	Posterior; midforceps; large subdural and subtentorial hemorrhages	Typical amniotic fluid; some pus cells in exudate

\*S signifies "stillborn."

TABLE I—CONT'D

NO.	AGE	POSSIBLE ETIOLOGIC FACTORS	ALVEOLAR CONTENTS
25	11 min.	Multiple uterine fibroids showing rapid growth since conception; bag induction; kidney toxemia	Marked amniotic aspiration with meconium in large amounts in alveoli
26	Few min.	Premature bleeding	Typical aspiration picture
27	S	Bag induction; breech	Typical aspiration with red cells and pus cells in exudate in large numbers
28	4 hr.	Dry labor; hemorrhages in adrenal glands	Typical aspiration
29	36 hr.	Nothing of importance	Marked aspiration in right lung; few eosinophiles in exudate
30	S	Mother eclamptic; 5 convulsions prior to delivery; laceration of tentorium cerebelli with subtentorial hemorrhages	Pigment in the fluid in the alveoli in large amounts.
31	6 da.	Mother in shock from attempted abortion	Fibrin and amniotic fluid only in alveoli, not marked
32	S	Mother eclamptic; severe convulsions prior to delivery; version and extraction; fracture of cervical spine; hemorrhages in falx; multiple placental infarcts	Typical aspiration
33	Few min.	Mother eclamptic; baby bled from nose after delivery; placental infarction	Typical aspiration
34	S	High forceps; induced labor; subtentorial hemorrhages	Meconium and amniotic fluid in alveoli
35	S	Dry labor	Typical aspiration; many epithelial cells
36	S	Dry labor; mother bled profusely prior to delivery; child almost exsanguinated	Typical aspiration picture
37	S	Severe periods with premature contractions	Typical amniotic aspiration with meconium and exudate
38	S	Cerebral hemorrhages; twin; laceration of falx	Massive aspiration, typical picture
39	24 hr.	Congenital pulmonary stenosis and fetal endocarditis	Typical aspiration with diffuse purulent exudate
40	S	Nothing of importance	Typical aspiration with some scattered pus cells
41	24 hr.	Low forceps; delivered face up; mouth-to-mouth insufflation; extensive adrenal hemorrhages	Typical aspiration
42	4 hr.	One month premature; nothing else of importance	Pus cells and serum and fibrin as well as typical amniotic fluid
43	2 hr.	Cesarean section; mother had high grade mitral stenosis; baby had coarctation of aorta	Patchy aspiration picture—not marked

TABLE I—CONT'D

NO.	AGE	POSSIBLE ETIOLOGIC FACTORS	ALVEOLAR CONTENTS
44	Few hr.	Mother had long auto ride just before delivery; mouth-to-mouth insufflation	Typical aspiration with formation of hyaline membrane
45	S	Mother eclamptic	Typical aspiration
46	S	Multiple fibroids and uterine hemorrhages prior to delivery	Aspiration of amniotic fluid; pus cells in exudate in alveoli
47	Few min.	Mother had kidney toxemia	Typical aspiration (not marked)
48	12 hr.	Breech; long labor; large amount of ether anesthesia	Amniotic fluid and marked hemorrhages
49	Few min.	Long motor trip prior to delivery	Small patchy areas (not marked) of intraalveolar amniotic fluid
50	S	Cesarean section; premature rupture of membranes; dry labor; bag induction	Massive amniotic fluid aspiration
51	S	Mother had ischiorectal abscess	Typical aspiration
52	S	Breech; dry labor; macerated fetus	Amniotic fluid and calcified debris in alveoli
53	3½ hrs.	Nothing of importance	Massive aspiration
54	1 min.	Cord twice around neck	Large amounts of amniotic fluid and massive purulent exudation
55	S	Marked placental infarcts; cord twice around neck; hydrops fetus universalis	Amniotic fluid containing considerable meconium in alveoli
56	3 hrs.	Nothing of importance	Amniotic fluid and many epithelial cells in alveoli
57	Few min.	Mother had pyelitis with high fever and chills	Amniotic aspiration with red cells and meconium pigment
58	S	Premature separation of placenta following severe auto accident	Large amount of amniotic fluid and hemorrhage in alveoli
59	Few min.	Nothing of importance	Patchy amniotic aspiration—not marked
60	--	Did not breathe but heart beat for a few minutes; high forceps; Bandl's ring; cerebral hemorrhages	Massive aspiration with extensive hemorrhages
61	S	Premature; eclampsia; macerated	Amniotic fluid; very small amounts
62	24 hrs.	Eclampsia with 4 convulsions; premature	Typical amniotic aspiration with many pus cells in alveoli
63	3 da.	Premature; mother syphilitic; had vigorous treatment	Amniotic fluid and superimposed confluent bronchopneumonia
64	S	Mother had flat pelvis; cesarean section	Marked amniotic aspiration
65	9 da.	Premature bleeding; low forceps; generalized edema	Amniotic fluid and generalized pulmonary edema
66	S	Nothing of importance	Massive aspiration

mode of infection of the alveolar content in such lungs is still subject to considerable speculation.

Table I was assembled in an effort to show what some of the possible etiologic factors producing an aspiration might be.

It will be noted that eclampsia was present in 7 cases, hypertension in one case; 5 of the babies were delivered by cesarean section; in 2 instances there was infection present in the mother; in 2 cases the mothers had taken long automobile rides immediately prior to delivery, while in one case the mother was in a severe motor car accident which precipitated labor with premature separation of the placenta and profuse hemorrhage; large uterine myomas complicating pregnancy were observed twice; version was attempted without success in



Fig. 1.—Low power photomicrograph showing pulmonary alveoli filled with amniotic epithelial cells and masses of vernix caseosa aspirated from the amniotic sac.

one case. Four of the infants in this series were delivered as a breech, and 7 cases were listed as hard labors where forceps were applied. Concomitant cerebral hemorrhage was observed in 9 of the babies and massive adrenal hemorrhage was seen twice. Strenuous mouth-to-mouth insufflation was applied in an effort to resuscitate 3 of the babies. In 6 cases, there was a long dry labor. Five labors were preceded by premature maternal bleeding. In one instance, the mother was in severe shock from attempted abortion, and in another the mother had a severe complicating ischiorectal abscess. A difficult posterior presentation was encountered three times, and in 3 cases the cord was found wrapped around the neck. Congenital anomalies were found in 7 of the babies, and extensive infarction or placental fibrosis was seen nine times. Bag induction was attempted four times in this series, and 8 of the infants were premature. A very long labor and

the administration of a large amount of ether were possible causes of intrauterine asphyxia in one case. Premature contractions of long duration were observed once, and a difficult delivery with face presentation was present in another case. A Bandl's ring was seen in one case, and in two instances the babies were twins. In 7 cases nothing could be found, in a most careful search of the clinical record, which seemed to have any bearing whatever on the aspiration.

*Pathology.*—An analysis of Table I also shows that in 12 cases microscopic examination of the lungs revealed a very extensive intraalveolar purulent infiltration. In this series where there was a typical inflammatory exudate present, 5 were stillbirths, one lived only one minute, and another lived four hours. The remaining 5 lived twelve hours or

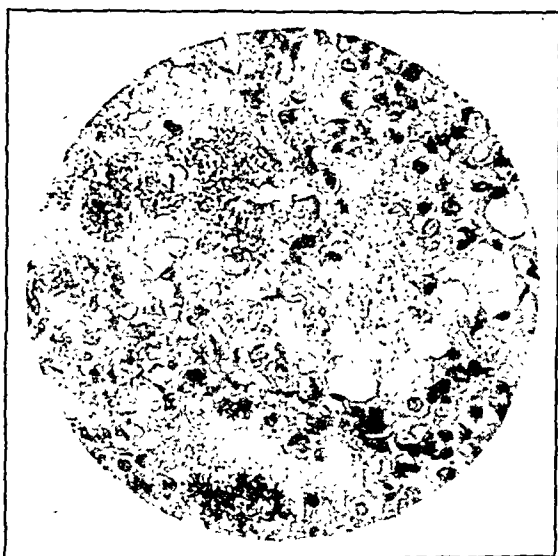


Fig. 2.—High power photomicrograph of lung of stillborn infant. Large amounts of pigment thought to be meconium may be seen in the fluid in the alveoli.

longer, and hence, were of sufficient age that a superimposed infection after delivery could readily have been the cause of the purulent pneumonic consolidation.

Very marked findings of asphyxia were seen in fifteen instances which was evidenced by extensive subendothelial hemorrhages involving particularly the pleura and pericardium. In a majority of cases, some few subserous petechiae were seen, but in these fifteen instances it was a very striking finding.

All stages of pneumonic consolidation were observed in the microscopic sections of these lungs. It is important to mention here that very frequently the naked eye appearance of the lungs showed nothing diagnostic of pneumonia. Furthermore, it was often necessary to examine sections from several areas in the lungs to get a clear idea of the degree of involvement, since some areas showed a relatively normal picture while in other lobes varying stages of aspiration, progress-

ing to frank purulent exudation, were seen. These latter findings suggest an initial aspiration with redistribution by coughing. In a majority of the cases, microscopic examination showed no true acute inflammatory exudate; and in some of the lungs, where nothing but amniotic fluid was observed in the alveoli, we found the most advanced and striking evidence of asphyxia, such as huge subendocardial and subpleural hemorrhages. In a large proportion of the cases, the histologic picture gave one the impression that the fluid did not act as an irritant to the alveolar lining. However, the presence of a frank acute inflammatory exudate in the amniotic fluid in lungs of stillborn infants, in which sections no bacteria were demonstrable, was a rather difficult finding to explain in case the fluid is to be considered non-irritating. Moreover, in the babies that lived from twelve hours to



Fig. 3.—High power photomicrograph of the lung of a stillborn infant. Note the exudate of polynuclear leucocytes in the alveoli. No microorganisms were demonstrable.

four or five days, in which a lobular pneumonia with a purulent exudate was found in addition to the presence of amniotic fluid, bacteria could be found; hence, it appears that the fluid may have been of some importance in making the lungs more vulnerable to bacterial invasion. This seemed to be more particularly indicated in the not infrequent instances where meconium was found in the amniotic fluid.

The question of placental transmission of infection is of great importance. In the older literature, there are cases of congenital pneumonia recorded in which the mother was suffering from the infection at the time of delivery, but only twice in our series was there any demonstrable bacterial infection present in the mothers while the lungs of both of the infants showed only a pure aspiration of fluid without the presence of an inflammatory exudate.

With premature rupture of the water bag, the opportunity for bacterial contamination of the amniotic sac is not only possible but highly probable. In the 5 babies that lived more than four hours, aerogenous infection or possible contamination of nasal and oral cavities by the bacterial flora of the vagina could readily have been the sources of the pulmonary infection.

Microscopic examination of the placentas in a large number of cases failed to reveal any degree of placentitis, and in only 7 cases was a noteworthy placental infarction present which could possibly have influenced intrauterine respiration. Inasmuch as routine examination of all placentas in our hospital so frequently reveals infarcts of almost



Fig. 4.—High power photomicrograph of lung showing so-called "hyaline" or "vernix" membrane lining the alveolar walls.

as great and, in some events, even greater magnitude without any clinical signs of aspiration in the baby, we feel that this alone cannot be a very frequent or particularly important factor in intrauterine asphyxia.

Among the associated findings at necropsy was the almost universal presence of subendothelial hemorrhages and the not rare complicating hemorrhages in the brain. In some cases it seemed that birth trauma might have been a factor in producing the brain hemorrhage which, in turn, could then, by pressure on the respiratory center, stimulate premature respiratory efforts with the resultant filling of the lungs with amniotic fluid. However, it is impossible to give this as the only pathogenesis, and, in some cases, it could not be said that the brain hemorrhages were not the result of asphyxia due to the aspiration.

## CONCLUSIONS

1. Necropsy studies of the lungs in 159 stillborn and newborn infants showed in sixty-six instances sufficient amounts of amniotic fluid in the alveoli to be considered as an important factor in the death of the infant by causing asphyxia or by lowering the resistance of the baby that was already suffering from a long labor.

2. In many cases, the possible causative factors producing the aspiration seemed to be wholly or in part preventable.

3. Maternal infection or placental disease did not appear to play any part in the production of the aspiration.

4. To the naked eye examination, the lungs may not appear abnormal, and microscopic examination of all pulmonary lobes is necessary to get a complete picture of the pathologic processes.

5. Superimposed purulent intraalveolar exudation in stillborn infants, where no bacteria were demonstrable, suggests that at times the aspiration of amniotic sac contents, particularly when containing meconium, may act as an alveolar irritant.

6. Asphyxial hemorrhages were almost universally present and, in 23 per cent of the cases, constituted a striking picture at necropsy. Brain hemorrhages were seen quite frequently and, in many instances, could have been either possible causative factors or the result of asphyxia.

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CHANGES IN THE URINARY TRACT DURING PREGNANCY\*

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THE frequency with which infections of the urinary tract are associated with pregnancy has been a source of constant concern to obstetricians. That the literature is replete with observations, deductions, and experimental studies concerning this association is an index of the recognition which has been accorded this problem.

Urologists and obstetricians have long been familiar with the picture of kinked, tortuous, and dilated ureters, distended pelves and blunted or obliterated calices obtained by ureteral catheterization and x-ray with opaque media of patients with the familiar clinical symptomatology of urinary tract infection; just as they have been familiar with the clinical improvement which usually followed this ureteral catheterization (Kelly,<sup>1</sup> Braasch,<sup>2</sup> Young and Waters,<sup>3</sup> Woodruff<sup>4</sup>).

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Hunner<sup>5</sup> mentioned the frequent association of ureteral stricture with hydronephrosis, an association not so frequently found by other investigators. Braasch,<sup>2</sup> Stevens and Henderson,<sup>6</sup> Crabtree,<sup>7</sup> Morris and Langlois,<sup>8</sup> and a host of others reported these pyelographic x-ray findings in kidney infection and assumed that infection occurred in an atonic ureter, dilated because of obstruction by pressure of the growing uterus.

J. T. Williams<sup>9</sup> stressed the importance of a preexisting, quiescent pyelitis reactivated by pregnancy, especially as Corbus and Danforth<sup>10</sup> found in infected cases persistent hydroureter and hydropelvis following the termination of pregnancy. Of classic importance, however, was the finding by retrograde pyelography that dilatation of the ureters and kidney pelves occurred in patients without symptoms of urinary tract disease (Kretschmer and Heaney<sup>11</sup>). Duncan and Seng<sup>12</sup> showed that ureterectasis and pyelectasis occurred as early in pregnancy as the sixth week, that involution of these dilated structures occurred following the termination of the pregnancy and that these findings were more evident on the right than on the left side, although Mengert and Lee found a much higher percentage of bilateral dilatations.

The use in uninfected cases of the retrograde method in studying the pyelography of the normal kidney in pregnancy, particularly in the latter months, was a somewhat questionable procedure. The advent of the use of intravenous dyestuffs as pyelographic media was a boon to both urologists and obstetricians. Sporadic investigation with these agents during the past two years by Schumacher,<sup>13</sup> Mengert and Lee,<sup>14</sup> Guthmann and Ehrhardt,<sup>15</sup> Prather, Crabtree and Robbins,<sup>16</sup> Baird,<sup>17</sup> Greume,<sup>18</sup> Cornell and Warfield<sup>19</sup> verify the value of these agents as contrast media in the x-ray visualization of the urinary tract.

These investigators found that in pregnancy there was almost constant dilatation of the ureters and kidney pelves, usually more frequent on the right side but often bilateral. All agree that there is compression and obstruction of the ureter along its course by either the growing uterus (Crabtree,<sup>7</sup> Braasch,<sup>2</sup> MacGowan,<sup>20</sup> Stevens and Henderson<sup>6</sup>) or by the pull of the uterus downward which flattens the lumen of the ureter across the pelvic brim (Cumston<sup>21</sup>) or hypertrophic changes in the pelvic portion of the ureter associated with intravesical edema with compression, the view advanced by Hofbauer.<sup>22</sup> Superimpose on this recognized dilatation with stasis, an infectious process and we have satisfied all the criteria necessary in the etiology of pyelitis (Williams,<sup>23</sup> Duncan and Seng<sup>12</sup> and others).

In evaluating this mass of factual evidence we have been impressed with the diversity of method and the choice of clinical material which

was used, and have outlined, in consequence, this study of a controlled series of cases from early pregnancy through the puerperium. This presentation concerns only the antepartum phase of the investigation.

We have chosen a carefully picked group of 50 healthy, primiparous women. Primiparous, because they had never before been pregnant and had thus never before been subjected to the ever present possibility of renal infection or the urinary changes which have been described as being associated with pregnancy and the puerperium. Carefully selected in that on rigid scrutiny of every history, none of these women presented previous or present symptoms referable to kidney pathology. Only those were admitted to the series who were free from any indication of kidney disease or complaint. None of these patients showed formed elements or more than a very faint trace of albumin on analysis of the urine. No blood pressure reading on any occasion rose above 128/80. As a possible contributing physical factor in explanation of the anatomic changes which were noted, observations were made regarding the constitutional habitus, the so-called phenotype, as brought out by Gellhorn,<sup>29</sup> quoting Mayer, the type of uterus and bony pelvis and the efficiency of the abdominal wall as a support for the growing uterus. So that after all the criteria were satisfied, the individuals chosen for this study were from a picked group of apparently healthy, primiparous women in the seventh, eighth, and ninth months of pregnancy.

Intravenous pyelography was used exclusively because of the ever potential risk in the retrograde method of introducing infection into the urinary tract. Postpartum urinary infection in a healthy patient on whom retrograde pyelography was done antepartum would bring up the question as to whether the direct etiologic factor in the infection were not brought to her following a possibly unwarranted manipulation. In Duncan's series there was a rise of 38 per cent in the incidence of white blood cells discovered in the urine specimens of women following catheterization of the ureters. This factor of possible infection following manipulation will not be present when these cases are followed along postpartum. Bizarre shapes in the ureterogram caused by the mechanical trauma of the catheters and retrograde filling of the ureter, angulation, kinking and artificial displacement of the ureters are all obviated by the use of intravenous dye.

Neo-iopax was used in preference to skiodan because of the smaller bulk of injected material, only 20 c.c. being necessary for injection. Warmed, and injected slowly into the cubital vein, the drug is well borne, the only reaction in over 50 cases being thirst in 16 cases and a transient pain in the axilla of the injected arm in 4 cases, symptoms almost identical with those reported by Prather, Crabtree, and Robbins.<sup>13</sup> For a five-minute plate, adequate distention of the pelvis and

upper ureter was obtained with the patient in slight Trendelenburg posture, and a subsequent twenty-minute plate with the patient in the horizontal position usually showed the ureter in full outline. Two pictures were usually found to be sufficient.

FINDINGS

In the 50 cases studied the most striking finding was the almost constant distention or dilatation of the urinary conducting system, some deviation from the normal occurring in 92 per cent of cases. Obviously the only true criterion for measuring this dilatation is a comparison between the antepartum plate and the plate of the organ before pregnancy supervened. In lieu of this, however, the next best standard is a comparison with the postpartum plate when involution might be assumed to be complete.

MINOR CALICES

NO. OF CASES	CHANGE	NO		BLUNTING				DILATATION				BOTH				
		CHANGE		RT.		LT.		RT.		LT.		RT.		LT.		
50	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
	42	84	8	16	23	46	5	10	37	74	19	38	23	46	5	10

		NO. OF CASES	%
Changes in the major calices	Right side	44	88
	Left side	23	46
Changes in the pelves	Right side	45	90
	Left side	22	44
Changes in the ureters	Right side	39	78
	Left side	30	60
Displacement of the ureters	Right side	6	12
	Left side	19	38
Displacement with dilatation	Right side	6	12
	Left side	12	24
Displacement without dilatation	Right side	0	0
	Left side	7	14
Angulation, kinking or torsion	Right side	24	48
	Left side	13	26
Same with dilatation	Right side	22	44
	Left side	9	18
Same without dilatation	Right side	2	4
	Left side	4	8

With this medium the pelvic ureter was visualized in only a small proportion of cases antepartum. Whether this is so because of the difference in histologic structure of this part of the ureter or not it is significant of the fact that obstruction at the juxtovesical and intravesical portion of the ureter probably does not take place.

Demonstrable change in urinary tract	92%	46 cases
No demonstrable change	8%	4 cases

Presentation and position of the fetus apparently have no influence on the dilatation, displacement, or distortion of the urinary tract as the following figures clearly show.

NO.			DILATATION								URETER			
			CALICES				PELVIS							
			RT.		LT.		RT.		LT.		RT.		LT.	
			NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
44 Vertices	Right	17	13	77	7	41	15	88	6	35	12	70	8	47
	Left	27	18	67	11	37	23	85	10	36	20	73	14	53
1 Transverse		1	1	100	0	0	1	100	0	0	0	0	0	0
5 Breech	Right	2	2	100	1	50	2	100	2	100	2	100	2	100
	Left	3	3	100	0	0	2	66	2	66	2	66	1	33

Likewise having no bearing on these urinary tract changes is the type of pelvis.

NO. OF CASES	PELVIS	DILATATION		NO CHANGE	
		NO.	%	NO.	%
9	Male type	8	88	1	12
41	Normal type	36	87	5	13

From the standpoint of pelvic mass and weight, the type of uterus has little or no bearing on the urinary tract changes.

NO. OF CASES	UTERUS	DILATATION		NO CHANGE	
		NO.	%	NO.	%
10	Long broad	9	90	1	10
11	Long thin	10	90	1	10
24	Short broad	21	87	3	13
5	Short thin	4	80	1	20

There is apparently no foundation for the theory that the tenseness or the relaxation of the abdominal wall are causative factors in these changes.

NO. OF CASES	ABDOMINAL WALL	DILATATION		NO CHANGE	
		NO.	%	NO.	%
14	Relaxed	12	85	2	15
36	Firm	29	81	7	19

The habitus of the individual as an indication of the tone of the pelvic supports and connection between this factor and ureteral atonia is graphically charted.

NO.	HABITUS		DILATATION		NO CHANGE	
			NO.	%	NO.	%
46	Sthenic	colored 4	3	75	1	25
		white 42	34	80	8	19
4	Hyposthenic		4	100	0	0

Figs. 1 and 2 are illustrative of the fairly constant finding in this series.

We are not touching in this paper on the question of urinary stasis. In spite of the apparent pyelographic evidence that the dilatation and stasis go hand in hand, at this writing we are not convinced that there is not some disturbance in the secretory and excretory function of the kidney itself. We have noted delay of from five to fifteen minutes in excretion of the dye antepartum into the calices and kidney pelvis, particularly so on the right side. Whether this delay in visualization



Fig. 1.—P. P. Antepartum, no symptoms.

high in the urinary conducting tract is due to counter pressure against a stagnant column of urine or whether this is an indication of retarded secretion and excretion by the kidney, we are not yet prepared to state.

#### COMMENT AND CONCLUSIONS

We have shown, as have others, that ureterectasis and pyelectasis are almost constant findings in normal pregnant women who present no symptoms of urinary tract pathology. We have also shown that

neither the presentation nor the position of the fetus in the uterus has any connection with this dilatation; that neither the constitutional habitus of the individual, nor the pressure of the fetal head, nor the tenseness of the abdominal wall is a factor which enters into the causation of this phenomenon. The finding itself emphasizes the need for careful observation of the urinary tract throughout pregnancy and illustrates the importance of not evaluating the extent of the path-

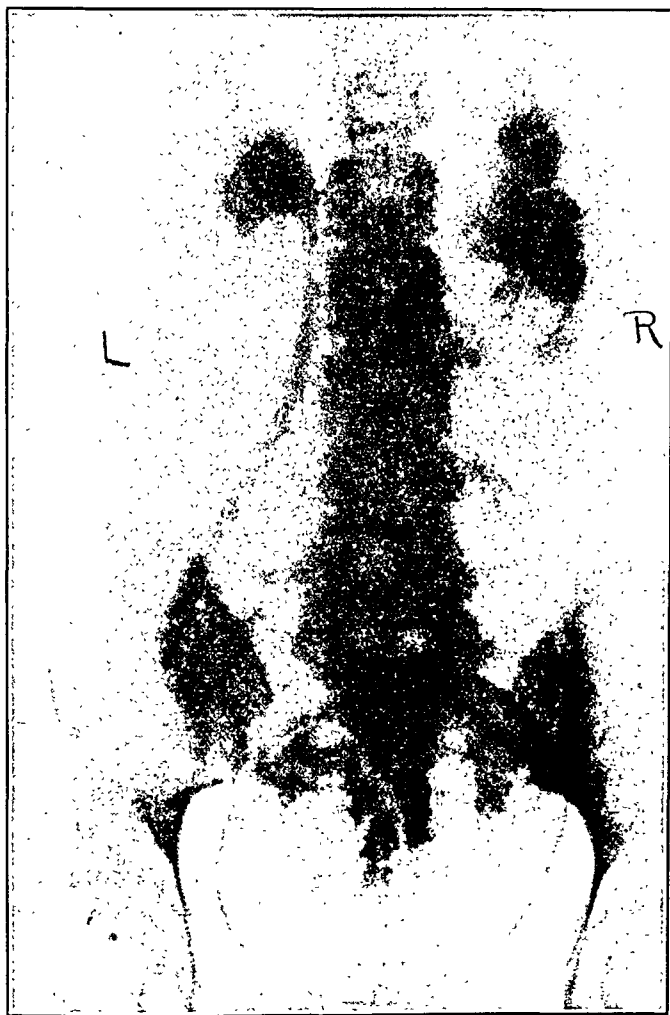


Fig 2.—E. T. Antepartum, no symptoms.

ology in urinary infections during pregnancy from the roentgenologic appearance but rather from the functional and clinical aspects. Fig. 3 illustrates this point, and is from a very sick woman who presented the typical syndrome of acute upper urinary tract infection complicating pregnancy.

I cannot concur in the belief advanced by Williams, Braasch, Schumacher, Crabtree and others, that the growing uterus exerts pressure on the ureters with resulting obstruction and dilatation. These

changes have been shown by Duncan and Seng and others to take place as early as the second, third, and fourth months in pregnancy when the uterus is a freely movable centrally placed and soft pelvic organ, where the pressure factor does not operate. I have shown, furthermore, as have Stein and Rodgers<sup>24</sup> that harder and larger pelvic tumor masses such as fibroids and ovarian cysts, in nonpregnant primiparous and multiparous women caused no demonstrable change in the



Fig. 3.—F. C. Antepartum, symptoms of acute upper urinary tract infection.

urinary apparatus, the pelves and the ureters in these women being normal throughout. Fig. 4 is from a primiparous woman who at subsequent laparotomy showed a right ovarian cyst the size of a five months' gravidity. Neither do we consider tenable the conclusion offered by Duncan and Seng and Baird that in pregnancy the increased vascularity of the cervix and the parametrium and the consequent congestion of the parametrial tissues, affect that portion of the ureter which crosses the pelvic floor from the side wall of the pelvis to its intravesical termination. By those who have had occasion to pass

ureteral catheters in women during pregnancy, it will be admitted that once the ureteral orifice is in the cystoscopic field, and the tip of the catheter started on its journey that the difficulty, if any, is usually not in the lower third of the course of the ureter (R. A. McComb,<sup>25</sup> Duncan and Seng). Cases of chronic parametritis, the so-called frozen pelvis with bony hard parametria extending from pelvic wall to pelvic wall, where pressure from inflammatory exudate might be assumed to be present, demonstrate no change in the urinary apparatus. Intra-vesical edema seems to play but little part in this phenomenon. Beer

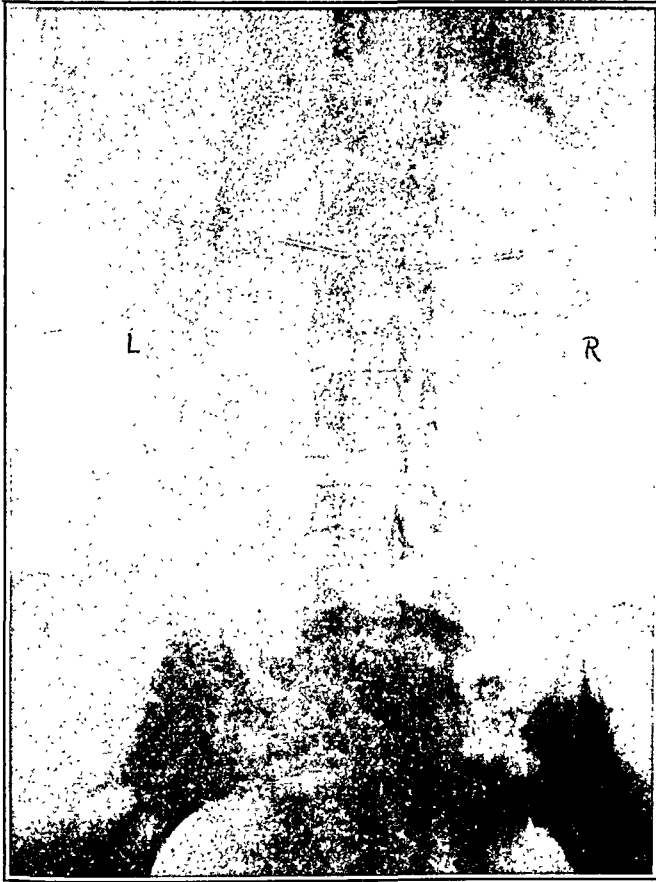


Fig. 4.—S. P. Not pregnant. Primipara with right ovarian cyst.

recently described ureterovesical anastomoses through vesical incisions without regard to the formation of a new ureterovesical sphincter and reported neither reflux into the ureters nor signs of compression. At operation the ureters of pregnant women are found to be sometimes as big around as a thumb and the renal vessels are tremendously dilated and engorged.

Studies on pregnant women at autopsy by Carson,<sup>26</sup> by Baird and by Hofbauer demonstrate grossly the enlargement and thickening of the whole ureter and lay emphasis on the tubelike rigidity throughout the course of the pelvic ureter. Histologically the entire ureter shows



a definite and marked hypertrophy and hyperplasia of the muscular and epithelial elements, far different from that seen in the nonpregnant organ. In addition Hofbauer and Baird both remark upon the marked increase in connective tissue elements in the pelvic ureter which gives it its semirigid structure. An observation, never made before Hofbauer, was that there was at the same time a marked increase in the lower uterine segment of the same type of new connective tissue. A similar hypertrophy occurs in the retrocervical nerve



Fig. 5.—F. F. Postpartum nine days, no symptoms.

plexuses. In postpartum studies made five weeks after labor Hofbauer was able to demonstrate that involution occurred. The connective tissue elements showed regression, the muscular elements diminished markedly in number and size, and there appeared to be a rapid return to the histologic characteristics exhibited by the organ in the nonpregnant female.

As elementary as is the present state of knowledge concerning the embryology of the genital and the urinary organs, there is sufficient evidence to point out the remarkably close relationship which exists

between the elements of the müllerian system and the mesonephrotic elements of the wolffian system. Even the nerve supply to these closely allied systems is of more than passing interest. Whether or not one agrees with the myogenic theory of ureteral peristalsis of Engelmann (1869) or Hryntschak (1923), neither of whom could find ganglia in the urinary conducting system, or with the neurogenic theory of Maier (1881) or Macht (1917), who found ganglia present similar to the plexuses in the heart and intestine as found by Meissner and Auerbach, one must be impressed by the fact that the organs involved in the hypertrophy of pregnancy, i.e., uterus, round ligaments, pelvis of the kidney, and ureters, are supplied by autonomic nerve fibers from the same segments of the cord and from the same nerve plexuses; and that these plexuses are known to undergo definite enlargement and hypertrophy during pregnancy and involution following its termination. Wharton's<sup>30</sup> stained sections of the genitourinary autonomic nerve supply show definite and direct nerve trunk connections between the ovarian plexus and the ureter.

These ureters of pregnancy are undoubtedly dilated and displaced. It is not consistent with the usual course of events to assume that, after having been subjected to such marked dilatation in some cases for six months, without symptoms of any kind, that these structures can involute to normal size and shape within a period of hours or days if the process were not physiologic rather than pathologic. Fig. 5 illustrates the rapid involution which takes place in the urinary system following delivery.

Although far from conclusive at this point in our study, there is apparent a not inconsiderable amount of evidence which seems to indicate that the same factor which causes the hypertrophy and involution of the uterus and round ligaments may be responsible for the changes occurring in the urinary tract. When this study is completed we may possibly have sufficient evidence upon which to base a really tenable theory as to the causation of this phenomenon.

I wish to thank Dr. Samuel A. Cosgrove, Director of the Margaret Hague Maternity Hospital, not only for according me the privilege of undertaking this work, but for his helpfulness in furthering it; Dr. E. J. Daly, for the use of the material from the Urological Service and Dr. Harry J. Perlberg of the X-ray Department for his help and encouragement.

#### REFERENCES

- (1) Kelly, H. A., and Burnam, C. F.: Diseases of the Kidneys, Ureters and Bladder, 1925. (2) Braasch, W. F.: Urography, 1927. (3) Young, H. H., and Waters, C. A.: Urological Roentgenology, 1928. (4) Woodruff, S. R.: Urographic Urology, 1931. (5) Hunner, G. L.: AM. J. OBST. & GYNEC. 9: 47, 1925. (6) Stevens, W. E., and Henderson, J. G.: J. A. M. A. 93: 1282, 1929. (7) Crabtree, E. G.: New England J. M. 205: 1048, 1931. (8) Morris, H. L., and Langlois, L. J.: AM. J. OBST. & GYNEC. 22: 211, 1932. (9) Williams, J. T.: AM. J. OBST. & GYNEC. 10: 765, 1925. (10) Corbus, B. C., and Danforth, W. C.: AM. J. OBST. & GYNEC. 14: 4, 1927. (11) Kretschmer, H. L., and Heaney, N. S.: J. A. M. A. 85: 406, 1925. (12) Duncan, J. W., and Seng, J. I.: AM. J. OBST. & GYNEC. 16: 557, 1928. (13) Schumacher, P.: Arch. f. Gynäk. 143: 28, 1930. (14) McNaught, W. F., and Lee, H. P.: AM. J. OBST. & GYNEC. 24: 205, 1932.

- (15) *Guthmann, H., and Ehrhardt, K.*: Zentralbl. f. Gynäk. 55: 341, 1931. (16) *Prather, G. C., Crabtree, E. G., and Robbins, S. A.*: New England J. M. 206: 2, 1932. (17) *Baird, D.*: J. Obst. & Gynec. Brit. Emp. 38: 516, 1932. (18) *Greume, A.*: Arch f. Gynäk. 145: 132, 1931. (19) *Cornell, E. L., and Warfield, C. H.*: AM. J. OBST. & GYNEC. 23: 755, 1932. (20) *MacGowan, G.*: J. A. M. A. 64: 226, 1915. (21) *Cumston, C. G.*: Am. J. M. Sc. 131: 118, 1906. (22) *Hofbauer, J.*: Bull. Johns Hopkins Hosp. 42: 118, 1928. (23) *Williams, J. M.*: Obstetrics, 1927. (24) *Stein, A., and Rodgers, M.*: Surg. Gynec. Obst. 55: 490, 1932. (25) *McComb, R. A.*: Canad. M. A. J. 25: 296, 1931. (26) *Carson, W. J.*: J. Urol. 16: 167, 1926. (27) *Keibel, F., and Mall, F. P.*: Human Embryology. (28) *MacLeod, J. J. R.*: Physiology and Biochemistry in Modern Medicine, 1930. (29) *Gellhorn, G.*: AM. J. OBST. & GYNEC. 24: 481, 1932. (30) *Wharton, L.*: J. Urol. 28: 639, 1932.

## FERTILITY IN THE MALE

### I. TECHNICAL PROBLEMS IN ESTABLISHING STANDARDS OF FERTILITY\*

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FROM a practical standpoint sterility means the nonproduction of living children, and in addition to failure of conception includes those abortions which are due to some defect in the male or female germ cells. In the more restricted sense in which it is used here the term, sterility, implies the absence of conception.

The causes of sterility may be classed as: (1) abnormalities in the morphology and physiology of the *male* germ cell; (2) abnormalities in the morphology and physiology of the *female* germ cell; (3) incompatibility of sexual partner; and (4) low fertility level in one or both partners. The study of the fertility of the male presents perhaps one of the most direct methods of attack on the important problem of sterile matings.

Although considerable work has been done with the spermatozoa of animals, particularly of invertebrates, less attention has been paid to the more important human species. The chief difficulty is the adaptation of a suitable technic and the establishment of satisfactory criteria for evaluating the potency of human spermatozoa. In order to determine the question of fertility it is necessary first to develop a practical technic for testing human spermatozoa, and second to establish standards based upon the *normal* variations of the fertile male. Obviously no one method will suffice to determine the relative fertility of an individual. The several methods which have been suggested by various investigators possess not only limitations in technic but lack sufficient reliable data to establish their relative value. These methods in general are concerned with the number, abnormal morphology, and vitality of the spermatozoa.

The establishment of normal standards presents many difficulties, such as obtaining abundant suitable material, the problem of what

\*The second paper of the series, "Technic of the Spermatozoa Count," will follow in a later issue.

constitutes a normal individual, the varied and numerous factors which influence the production of spermatozoa in the individual, the variations in different individuals, and the technical pitfalls which are involved in the collecting and testing of the spermatozoa. It is the purpose of this paper to point out in a somewhat incomplete manner certain technical difficulties in the commonly accepted methods of determining male fertility which confuse the interpretation of the results of investigations and render difficult the establishment of suitable standards. Subsequent papers will deal in more detail with the various methods of testing spermatozoa and of evaluating fertility.

#### NORMAL INDIVIDUALS

It is a prime requisite that material should be obtained from a sufficient number of normal individuals who possess a reasonably high degree of fertility. The influence of age is an unknown factor. Obviously young adult males who have produced children are the most suitable subjects. Even then it is impossible to determine whether these individuals are of average, high, or low fertility, and in order to establish a reasonable average it is necessary to have a fairly large number, a most difficult task in view of the obstacles in obtaining material. Even in patients of proved fertility in the past, it is impossible to know whether this power still persists at the time of testing. Individual variation is a most striking characteristic, and the borderline case offers an additional problem.

Most important of all is the variation in the number, morphology, and vitality of spermatozoa in the individual. The factors producing these variations are complicated and involved. They include nutrition, exercise, rest, frequency of sexual intercourse, mental and nervous condition, and endocrine sufficiency. As a result single or even several specimens may give misleading information and the determination of the normal for any individual is most difficult.

#### COLLECTION OF MATERIAL

The specimen collected manually, as far as has been determined, is not in any way inferior to the condom specimen and possesses certain advantages for the purpose of study. The total volume of spermatic fluid is approximately the same for both methods, e.g., 4.42 c.c. for the manual and 4.30 c.c. for the condom in a series of 16 tests on one patient. The number of spermatozoa per cubic centimeter is practically the same, e.g., in one patient a series of 16 collections by manual and condom methods gave 112,850,000 vs. 110,824,000 respectively and showed little difference in the total number of spermatozoa, 516,581,000 vs. 491,077,000.

The vitality of the spermatozoa as determined by the length of time motility is maintained is strikingly different. Although the

period which the specimens were held in the condom was only about two hours before arrival at the laboratory, the vitality was seriously impaired, as is indicated in Table I.

TABLE I

METHOD	HOURS MOTILITY MAINTAINED AT 8° C.	
	IN SPERMATIC FLUID	IN BAKER'S SOLUTION
Manual	105	151
Condom	35	80

The inhibiting action of the condom depends upon the length of time that the specimen remains in the condom and upon the particular brand of condom or talcum preparation. In view of the almost universal use of the condom for the collection of specimens for laboratory examination, the interpretation of tests for vitality or motility should be most guarded, and wherever possible this method of collecting material should be discontinued.

## SPERMATOZOA COUNT

*Seminal Fluid.*—When first discharged the mixture of prostatic and testicular fluid consists of a tenacious, gelatinous portion and a thin milky fluid. If the discharge is collected in a bottle, the gelatinous portion adheres to the sides and the more fluid material may be separated by decantation. The ratio of the thin to the thick portion is usually 1 to 5 or 6. On examination spermatozoa may be found in both portions, extremely active in the thin fluid and enmeshed in the gelatinous material with movement considerably retarded. In one instance where the two portions were separated the count was 189 million per c.c. in the thin fluid and 74 million in the gelatinous. In a few moments after it is passed the fluid assumes a uniform consistency.

*Number of Spermatozoa.*—When a standard technic is followed carefully, a single count has an even chance of being within an error of 7.6 per cent. When careless methods of sampling are used the error is much greater.

Since the volume of the emission depends upon the proportion of prostatic and testicular fluids and varies at different times in the same individual, the number of spermatozoa per cubic centimeter represents only the concentration. The total number of spermatozoa in the emission, the product of volume and number per cubic centimeter, more accurately represents the total production of spermatozoa.

A considerable range in the number of spermatozoa exists in so-called normal men. Even the same individual, who tends to maintain a general level, at times shows extreme variations both in the number per cubic centimeter and in the total number per emission. Since the normal fluctuation is so marked, several specimens are necessary to determine the true level of spermatozoa production.

*Value.*—A single count in itself is not of great value in determining spermatogenic function. The total number of spermatozoa per emission, as determined from a series of specimens, is a good index of testicular activity. In this respect a certain degree of correlation is found between low counts and low fertility, but a low count per se is not indicative of sterility or even of low fertility.

*Vitality.*—The duration of motility is usually taken as the criterion of vitality in spermatozoa, although various chemical and physiologic tests have been devised. Viability depends upon the temperature at which and the menstruum in which the spermatozoa are held, and is subject to marked fluctuations. Spermatozoa may be held in the seminal fluid or in Baker's<sup>1</sup> fluid, a synthetic buffered solution. They may be kept satisfactorily under partial anaerobic conditions with reduced oxygen tension, sealed in capillary tubes, or exposed to the air in cotton stoppered tubes. The capillary tubes facilitate frequent observations, as they may be examined with the microscope without the removal of the fluid. Our tests indicate that motility is maintained longer in Baker's fluid than in the seminal fluid, e.g., at 8° C., an average of 153 hours in Baker's fluid as compared with 96 in seminal fluid. The longest period over which motility was observed was twenty-six days in Baker's fluid and ten days in the seminal fluid. Belonoschkin<sup>2</sup> reported a record of fifteen days for bull and rabbit spermatozoa in their own fluid.

*Individual Variation.*—At ice box temperature in Baker's fluid the duration of motility in the spermatozoa of three patients showed a considerable range, averaging 132, 153, and 201 hours respectively. A minimum of 37 and a maximum of 626 hours were obtained in 23 tests. Since spermatozoa are susceptible to minor changes in technic, and since it is difficult to maintain uniform conditions on successive days, it is impossible to make an absolute statement, but evidently there is a marked difference in the vitality of spermatozoa at different times in the same individual.

*Temperature.*—The temperature at which the spermatozoa are held influences the duration of motility. At the end of eighteen hours Moench<sup>3</sup> found a few spermatozoa alive at room and ice box temperatures in their own fluid, and a still greater number in a dilution of half seminal fluid and 5 per cent dextrose, whereas motility had ceased in all the incubator (37.5° C.) specimens. Our results in a series of 16 tests are given in Table II.

TABLE II. TEMPERATURE AND DURATION OF MOTILITY

	DURATION OF MOTILITY IN HOURS		
	37.5° C.	22-25° C.	8° C.
Spermatic fluid	23	30	96
Baker's fluid	23	32	153

These findings have a practical bearing on the collection of specimens for examination. Contrary to the prevailing opinion, seminal fluid should not be held at body temperatures previous to examination but should be kept cold.

## WORKING CLASSIFICATION OF ABNORMAL SPERMATOZOON MORPHOLOGY

I. Head	II. Body
1. Macro	1. Macro
1. Entire	1. Entire
1. Spherical	1. Spherical
2. Cylindrical	2. Cylindrical
3. Normal shape	3. Swollen
2. Anterior End (Cap)	2. Anterior End
1. Spherical	1. Spherical
2. Cylindrical	2. Cylindrical
3. Tapering	3. Tapering
3. Posterior End	3. Posterior End
1. Spherical	1. Spherical
2. Cylindrical	2. Cylindrical
3. Tapering	3. Tapering
2. Micro	2. Micro
1. Entire	1. Entire
1. Cylindrical	1. Spherical
2. Tapering	2. Cylindrical
3. Normal shape	3. Tapering
4. Narrow	4. Narrow
2. Anterior End	2. Anterior End
1. Cylindrical	1. Cylindrical
2. Tapering	2. Tapering
3. Posterior End	3. Posterior End
1. Cylindrical	1. Cylindrical
2. Tapering	2. Tapering
3. Malformations	3. Malformations
1. Absence of head	1. Absence of body
2. Multiple	2. Multiple
3. Cytoplasm adherent	3. Separation
4. Irregularities	1. From head
1. Shape	2. Anterior from posterior part
2. Rupture	4. Abaxial
3. Thickening	5. Cytoplasm adherent
1. Anterior	4. Irregularities
2. Posterior	1. Shape
4. Staining reaction	2. Rupture
1. Reversed	3. Bent
2. Clear	4. Staining
3. Solid	
	III. Tail
	1. Macro
	2. Micro
	3. Malformations
	1. Absence
	2. Multiple
	4. Irregularities

*Morphology.*—The presence of abnormal spermatozoa offers one of the best standards for estimating male fertility. Moench<sup>4</sup> in man and Williams and Savage<sup>5</sup> in the bull have shown that abnormalities and lack of proportion in the head of the spermatozoon have a distinct bearing upon fertility.

Spermatozoa from both fertile and infertile men show a certain percentage of so-called abnormal forms, varying with the condition of the individual. These include certain immature forms. Results so far indicate that the range between the fertile and the infertile individual in respect to the total number of abnormal forms is rather narrow and that a detailed study of abnormal types is necessary. Manifestly, since only certain abnormalities are of value in the diagnosis of male infertility, a determination of the percentage of the various types of so-called abnormal forms in the spermatozoa of normal individuals should be made and an index level be established for each type. Against this normal standard it will be possible to check the spermatozoa of supposedly infertile males.

In studying the spermatozoa of normal and infertile males we have found the following classification of abnormal types a convenient form for recording. The various abnormal types are designated by an identifying number which facilitates the recording of multiple abnormalities. This classification permits expansion to include any number of new forms.

#### SUMMARY

Certain technical problems which are involved in the establishment of standards of fertility in the male are discussed.

The importance of individual variations is stressed. The unsuitability of the condom as a vehicle of collection is noted. Specimens for laboratory examination should not be kept at body temperature. The inadequacy of the single spermatozoa count is shown.

A convenient method of classifying abnormal spermatozoa according to morphology is submitted.

#### REFERENCES

- (1) *Baker, J. R.*: J. Hyg. 32: 171, 1932. (2) *Belonoschkin, B.*: Ztschr. Biol. 92: 542, 1932. (3) *Moench, G. L.*: J. A. M. A. 94: 7, 1930. (4) *Moench, G. L.*: Med. Herald & Physiotherap. 47: 61, 1928. (5) *Williams, W. W., and Savage, A.*: Cornell Vet. 15: 353, 1925.

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## THE TREATMENT OF POSTPARTUM RETRODISPLACEMENT OF THE UTERUS\*

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THE sudden reduction of the uterine contents at confinement with the accompanying excessive mobility due to the laxity of supporting structures, predisposes the uterus to retrodisplacement during the postpartum involutionary period. The dorsal posture during convalescence and the tendency to overdistention of the bladder, commonly occurring in the bedridden, are further contributing factors. It is generally accepted that retrodisplacement of the uterus during involution may have the following deleterious effects:

1. The prevention of proper dependent drainage of the uterus.
2. Increase in tendency of the uterus to prolapse because of the coincidence of the axis of the uterus with the downward direction of the force of intraabdominal pressure, and the rendering permanent of the ordinarily temporary laxity of supporting structures.
3. The production of venous stagnation in the pampiniform plexus thus favoring permanent varicosities, a point emphasized by J. O. Polak.
4. Mechanical interference with future conceptions.
5. Production of mechanical complications during a future pregnancy resulting in abortion, pressure symptoms, or a distortion of the uterus making a cesarean operation necessary.
6. Secondary to the above objective abnormalities there may be produced many annoying symptoms. M. H. Phillips lists these as, lassitude, sense of pelvic weight, premenstrual dysmenorrhea, backache, menorrhagia, and leucorrhea.

A review of the literature shows that most of these facts have been partially or wholly understood by physicians for over a hundred years. Hodge, over seventy-five years ago, produced the Hodge pessary, a mechanical appliance for treatment of retrodisplacement of the uterus. It was then discovered that pessary treatment during involution would allow a sufficient tightening of the supporting structures to effect a cure of the malposition in a proportion of the cases. Various postural treatments and frequent manual replacement with massage were also advocated as effective treatment for retroversion or retroflexion of the uterus.

The development of a knowledge of aseptic and successful operative technic brought with it the invention of numerous operative methods for suspending the uterus. Perfection of this operation, so that it became simple in technic, and low in mortality and morbidity, resulted in considerable abuse. The anatomic finding of retrodisplacement of

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the uterus was considered by many surgeons to be sufficient indication for operation. Phlebitis, embolism, peritonitis, and intestinal obstruction, took their toll. Recurrence of the retrodisplacement after a pregnancy subsequent to suspension was found by Hurd to be one in seven cases. The combination of obstetrics and gynecology into one specialty in recent years has done much to rationalize the treatment of retrodisplacement of the uterus; and it is from that viewpoint that the conclusions of this paper are taken.

It is a striking fact, that, important as the subject of postpartum retrodisplacement may be, there are few accurate reports on the end-results of pessary and postural treatment in recent literature. It is not commonly mentioned in general reports of large lying-in hospitals, although it is a recognized routine of after care during hospitalization and follow-up in most of them. It is probable that accurate figures could not be obtained from most hospital ward and out-patient records, because final and follow-up examinations are usually done by internes early in their training and the same patient is rarely seen twice by the same interne. Furthermore, many ward patients appear for registration at over three months, so that it is impossible to correlate the position of the uterus, before and during early pregnancy, with the postpartum findings. It will be shown that this is a very important factor.

Private patients coming to the specialist, usually register early in pregnancy; they pay more attention to the discomforts of the early weeks; they are more interested in early diagnosis; and they have learned the importance of making early reservations in hospitals. Furthermore, the private patient is seen by the same physician from early pregnancy to the last follow-up. These visits in most cases, continue indefinitely at a minimum of six-month intervals after the involutionary period is over. It is apparent, therefore, that an analysis of the results of treatment of postpartum retrodisplacement of the uterus will be more accurate if obtained from an unselected group of private patients. Accordingly, this report is based upon a study of the records of cases in my active private files; patients unreasonably noncooperative or too recent to consider the results as final, were ruled out. The total number of private cases available for study is necessarily small but is sufficient for our purpose.

The following definitions and rules were followed in the diagnosis and treatment of this group of cases:

1. Diagnosis of retrodisplacement of the uterus was limited to those of second and third degrees only. Sturmdorf considered the position of the uterus normal when its long axis coincided with the axis of the plane of the inlet of the pelvis, and no uterus in this series was considered retrodisplaced when not definitely posterior to that axis.

2. Permanent cure of retrodisplacement of the uterus was limited to those cases in which the long axis of the uterus remained in coinci-

dence or anterior to the axis of the inlet of the pelvis. It was required that the uterus remain in that anterior position for at least one month after removal of the pessary.

3. Prophylactic measures during the first twelve days of the puerperium were limited to daily rest periods in the prone position and precautions against overdistention of the bladder.

4. At the final hospital examination, on or about the twelfth day postpartum, the following groups of patients received pessary treatment:

- (a) All cases in which the uterus was found to be retrodisplaced but replaceable manually.
- (b) All cases in which the uterus was found to be in retrodisplacement, and, though movable, not replaceable. Knee-chest exercises were advised in this group.
- (c) All cases in which the record showed the uterus to have been in retrodisplacement previous to or during the pregnancy.

5. The first follow-up visit to the office was regularly at four to five weeks postpartum. All pessaries were removed, cleaned and replaced after vaginal examination and inspection. Those cases which had developed a retrodisplacement of the uterus, since the final examination in the hospital, were fitted with pessaries. All patients whether wearing pessaries or not were instructed to take a daily cleansing douche and to return at four-week intervals for at least two more visits. Pessaries were removed, as a rule, at twelve weeks postpartum and a check-up made on the position of the uterus within a week. If the uterus was found to be in good position at that time the patient was asked to return in four weeks. If in normal position at the end of the four weeks' time, a return visit was requested in three to six months. An attempt was made to keep all patients indefinitely on a schedule of follow-up visits at a minimum of six-month intervals.

A tabulation of the results obtained by the above methods in a series of 165 private cases, 103 of whom were primiparae and 62 multiparae, shows that 26 or 25.3 per cent of the primiparae and 18 or 29 per cent of the multiparae had postpartum retrodisplacement of the uterus. Cures by means of pessary treatment in primiparae were 15 out of 20 or 75 per cent; in multiparae 4 out of 11 or 36.6 per cent. Of those who refused pessary treatment and were accordingly advised to take knee-chest exercises, cures were effected in 1 out of 5 or 20 per cent of the primiparae and 1 out of 4 or 25 per cent of the multiparae. It will be noted, in the small number of multiparae available, that pessary treatment is less than half as effective as in primiparae. Fröhinsholz in a report of 200 cases stated that retrodisplacement rarely occurs in multiparae unless it had occurred after the first delivery. B. P. Watson corroborates that statement. It is, therefore, obvious that every effort should be put forth to cure retrodisplacement

in primiparae, not only for its immediate effect, but also because it may prevent recurrence when they become multiparae, which recurrence in turn may be incurable without operation.

A study of the results obtained in those cases known to have retrodisplacement of the uterus during the early weeks of pregnancy, shows that 9 out of 14 or  $64\frac{2}{7}$  per cent of primiparae and 4 out of 6 or  $66\frac{2}{3}$  per cent of the multiparae in this small series, were cured by pessary treatment. The results were somewhat better in the multiparae than in the primiparae. The size of this series is too small to be conclusive, but it is apparent that the comparison between multiparae and primiparae in this group is not quite the same as in the first tabulation. The multiparae in this group must of necessity include some who failed to receive proper treatment after their previous deliveries, while the primiparae include a number who were undoubtedly suffering from retrodisplacement previous to pregnancy. It is interesting to note that the failures both in primiparae and multiparae correspond, proving that all failures were in patients showing retrodisplacements during pregnancy. An analysis of the records of primiparae known to have retrodisplacements of the uterus, previous to any pregnancy, shows that 4 out of 8 or 50 per cent were cured by pessary treatment. One more of these patients was apparently cured after the third pregnancy. These patients received concentrated and prolonged treatment.

It has been stated that it is impossible to cure any case of the so-called congenital retrodisplacements without operation and that this position is normal and asymptomatic in most instances. For that reason I wish to submit a short résumé of some of these eight cases:

CASE 1.—Mrs. S. J., aged thirty. This patient reported first at four months' gestation as a primigravida. She had been given pessary treatment for some years previous to pregnancy with relief of symptoms, of pelvic pressure, and backache due to retrodisplacement of the uterus. The uterus had been retrodisplaced during early pregnancy and had been replaced and held up by means of a pessary. She was delivered by means of low forceps and median episiotomy after four and one-half hours of labor, the baby weighing seven pounds. Four weeks after delivery the uterus was found to be retrodisplaced, and after manual correction a pessary was applied. Following three months' pessary treatment the uterus has remained in good position for over five years. She had a dilatation and curettage for incomplete spontaneous miscarriage at two months, but at no time was the uterus retrodisplaced. This patient had been repeatedly advised to have a suspension operation and the results show the fallacy of that advice.

CASE 2.—Mrs. A. M., aged twenty-three. One month after marriage this patient consulted a prominent gynecologist complaining of backache. A retrodisplacement of the uterus was diagnosed, and a suspension operation was advised without any attempt at manual replacement followed by pessary treatment as a therapeutic test. She was also advised that the position of the uterus practically excluded the possibility of conception. She declined the operation, discarded contraceptive measures, and missed the next period. A few weeks later she came to me with a two months'

pregnant uterus in third degree retrodisplacement and still complaining of severe backache. The uterus was gently and easily replaced manually and a pessary applied for two weeks. The backache was relieved and the pregnancy progressed normally. She was delivered by difficult, low medium forceps, because of a funnel pelvis, and suffered a deep second degree laceration. A pessary was applied twelve days after delivery. This was removed, cleaned, and replaced after one month. It was finally removed at two months postpartum, and seven examinations over the last two years have always shown the uterus to be in perfect position. This patient is of the tall, slender, under-weight, low vitality type. She has been afflicted with sinusitis and alveolar abscesses, and it is obvious that she had a narrow escape from a meddlesome operation.

CASE 3.—Mrs. I. M., aged twenty-eight. This patient had been married three months and her complaint was sterility. She had been a nurse in charge of an operating room. When told that her uterus was two degrees retrodisplaced and not manually replaceable, she immediately demanded an operation. She was advised to wait about three months more. The cervix was cleaned out and she promptly became pregnant. The uterus was easy to replace manually at two months and delivery at term was uneventful. A pessary was inserted about twelve days postpartum and after three months, pessary treatments were discontinued. Repeated examinations showed the uterus to be in good position. She went through another pregnancy without recurrence of the retrodisplacement. The uterus remained in position after the second delivery.

CASE 4.—Mrs. F. L., aged thirty-five. This patient had been advised to have a suspension operation for sterility. She refused and while wearing a pessary became pregnant. She was delivered uneventfully at term and refused pessary treatment. The uterus became retrodisplaced. Pressure symptoms and backache were relieved by replacement and pessary treatment. She later miscarried at two months and again the uterus became retrodisplaced in spite of pessary treatment with fair co-operation. She again became pregnant and reported when three months pregnant with the uterus three degrees retrodisplaced. Manual correction was difficult and painful. A pessary was inserted twelve days after delivery and she failed to return for six months. The pessary had been left in place and caused a mild vaginitis which cleared up in about a week. The uterus has remained in good position for about three months without a pessary support. This patient was classified as a failure as a primipara and a probable success as a multipara.

An analysis of the four failures in this group of prepregnancy retrodisplacements shows that one was due to lack of cooperation, one was due to fibromyoma of the uterus, and the other two were probably due to a developmental abnormality. This latter condition is characterized by a narrow vagina, a shallow posterior fornix, a short cervix, and an elongated uterine body. In this type, I have not been able to hold the uterus forward by means of a pessary.

In surveying the failures of pessary treatment in all the above described groups, it is important to emphasize that only a small proportion have symptoms which warrant operation. If they do have such symptoms, a suspension operation should be done as soon as the involutionary and nursing period is over. At the same time any other needs such as myomectomy or plastic work may be taken care of.

The surest road to failure in pessary treatment of retrodisplacement of the uterus is the inability to secure perfect cooperation of the patient. It is necessary to convince such patients of the importance of this treatment. It is essential to make clear to them that the fee set for the antepartum care and confinement also covers the follow-up visits of the first three months postpartum. Make them feel that they are not getting their money's worth if they do not make the proper follow-up visits. Last, but by no means least, every effort must be made to minimize all discomfort in the application and the wearing of the pessary. I should like to enlarge a bit on this point. With the advent of episiotomies and more accurate repairs of lacerations, pessary treatment of retrodisplacement of the postpartum uterus became difficult, painful, and inefficient. The caliber and tenderness of the introitus have no proportional relationship to the size of the pessary needed. A two-finger introitus will not admit a No. 4 Smith or Hodge pessary of the solid, hard rubber type. A small pessary will often fail to hold the uterus in anterior position. As a result both patient and physician were prone to postpone the use of a pessary beyond the time when the best results could be obtained.

To overcome this difficulty, I have devised a modification of the Albert Smith pessary which I have described in the June, 1930, number of the *AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY*. This pessary is identical with the ordinary Albert Smith type except that the end sectors have been replaced by solid soft rubber. These soft rubber segments are seamlessly vulcanized to the lateral arms which are of hard rubber. This arrangement allows the lateral arms to fold together and allows painless insertion through a one finger introitus. After insertion, the pessary unfolds and, by retention of longitudinal rigidity, effectively supports the uterus. If the lateral arms are brought together through the superior arc the upper bar of the pessary will automatically take its proper position behind the cervix, thus eliminating painful manipulation after insertion. This pessary may be molded to a Hodge shape or a circular shape by heating and molding with the fingers. The patient frequently does not realize that the pessary has been inserted as it provokes no more sensation than that of one finger. The circular shape will often effectively hold in correction a displaced postpartum uterus.

Some patients refuse postpartum pessary treatment because it interferes with a contraceptive device; to overcome this difficulty I have recently had the usual rubber dome applied to the circular folding pessary. This is easily introduced by the patient with the concavity directed posteriorly. When so inserted the pessary automatically unfolds with the upper sector properly in the posterior vaginal fornix. The rigidity of this pessary makes it as easy to introduce as a small douche tube, and its automatic placement renders self-

examination and inserters unnecessary. The patient can remove it daily, take a douche, and reinsert it, thus getting the benefit of both support and contraception.

Before summing up I should like to mention an observation which has strengthened my interest in the treatment of retroversion. Three nulliparae came to me with a history of repeated, spontaneous abortions at stages of pregnancy ranging from four to ten weeks. Retrodisplacement of the uterus was found and corrected in each case and a pessary inserted. The pessary was left in place until conception occurred and was undisturbed until the patient was over three months pregnant. The three cases progressed to term uneventfully and suggest the possibility that retrodisplacement of the uterus may interfere in some way with the proper nidation and development of the fertilized ovum.

#### CONCLUSIONS

1. Postpartum retrodisplacement of the uterus, of second or third degree, occurs in 25 per cent of the primiparae and in 29 per cent of the multiparae, and in nearly 100 per cent of those who showed such malposition before or during the early weeks of pregnancy.

2. The frequency of the development of symptoms and mechanical complications in these cases indicates that two degrees or more of retrodisplacement do not constitute a normal developmental variation and, therefore, the condition should not be ignored. Contributory proof of this conclusion is furnished by the fact that at least three out of eight cases of prepregnancy retrodisplacement showed symptoms directly traceable to the malpositions.

3. Correction of postpartum retrodisplacement of the uterus was obtained in 75 per cent of the primiparae and in 36 per cent of the multiparae by early and proper application of pessary treatment. The pessary should be inserted about the twelfth day postpartum in all cases showing this malposition, or who have shown such abnormality previous to or early in pregnancy. The average length of time of pessary treatment should be at least three months, and longer if examination shows recurrence.

4. The necessary cooperation of patients was obtained by stressing the fact that punctual follow-up visits are an important part of the routine in supervising confinement cases, and by the use of the folding pessary which rendered this treatment practically painless.

5. A suspension operation is indicated where the pessary fails and definite disabling symptoms persist. This should be put off, if possible, until after the involution and nursing period has been completed.

6. Failure to cure by pessary treatment after the first delivery reduces the chances of cure after future deliveries by about 50 per cent.

## DISCUSSION

DR. J. J. MADDEN.—At the Brooklyn Hospital we do not attempt any particular prophylactic measures to prevent retroversion, nor do we instruct the patients in any exercises while they are at home. Reviewing the histories of 262 women reporting for their first postpartum examination after leaving the hospital, retroversion of various degrees was found in 59, or 22 per cent. Of these only 12 had symptoms. At subsequent monthly examinations 12 of the 59 were found to be corrected; that is, without the use of any pessary, but simply by bimanual manipulation. We find in our hospital that many of the clinic patients, if they are symptom-free, fail to return. In fact, 42 of the 59 patients failed to come back for any further follow-up treatment.

DR. B. P. WATSON.—I have taught for a number of years the importance of diagnosing retroversion and retrodisplacement of the uterus in the early puerperium, but have found the greatest difficulty in getting house surgeons, internes, even residents, to realize its importance. To diagnose retroversion on the twelfth day of the puerperium should be the simplest thing possible, yet I know in our clinic quite a number of cases are missed. In all diagnosed cases the uterus is replaced and a pessary inserted.

We find that quite a number of patients who have been discharged with the uterus in normal position come back with the uterus retroverted. If the first return visit is not made until the sixth week of the puerperium, involution will be completed and no success will be obtained with the pessary treatment. It is important in the management of our obstetric cases to make not only the immediate postpartum examination but the second examination not later than four weeks postpartum.

In regard to Dr. Findley's pessary, I can only state that it has simplified and made easy the treatment of every postpartum retroversion. Hitherto our difficulty was in getting a sufficiently large pessary through a narrow introitus, especially where a repair had been done.

## AMNIOGRAPHY WITH SKIODAN INJECTIONS\*

## A PRELIMINARY REPORT

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NOT much attention has been given to amniography since this method was described by Menees, Miller, and Holly in 1930, and later by them in 1932. It has been used some by J. M. Munro Kerr and his associates at Glasgow, and, doubtless, by many others. A recent abstract appeared in the February, 1933, issue of the *Rivista d'Ostetricia e Ginecologia Pratica*. This refers to publications by various Italian authors who think well of the method. Otherwise there seems to be no other available literature.

In our clinic we have been carrying on some work with reference to the amniotic fluid. Dieckmann and Davis have already reported some of their volumetric determinations. We felt that skiodan might offer

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some advantage as a radiopaque substance to be injected into the amniotic fluid. It was first necessary to determine the optimum amount to be injected. This is difficult to ascertain as there is such a marked variation in the amount of the amniotic fluid.

In two cases in which skiodan was injected, the volume of the amniotic fluid was estimated. In one case (No. 70605) the estimated amount of fluid was 2,180 c.c., into which 20 gm. (50 c.c.) of skiodan were injected. This is equivalent to about a 0.9 per cent solution. In the other case (No. 71278) the same amount was injected into a volume of fluid, estimated at 1,208 c.c., which is about 1.65 per cent. It has been our experience that the optimum amount of the 40 per cent solution (by volume) to inject is from 15 to 30 c.c., which is equivalent to between 6 and 12 gm. of skiodan (Winthrop). We have injected as much as 30 gm. (75 c.c.), which gave too opaque a medium for good visualization of the fetus.

Skiodan (Winthrop) is an iodine-containing preparation which is sold in Europe under the name of "Abrodil." Chemically, it is mono-iodo-methane sulphonate of sodium and it contains 52 per cent of iodine. It is not broken up in the human body and no free iodine appears in the blood or urine. It is furnished in solutions, 40 per cent by volume, and withstands heat and boiling. It solidifies about 14° F., but liquefies at room temperature. The adult intravenous dose is 50 c.c. of the 40 per cent solution, or 20 gm. of the chemical. It may be diluted without damage by sterile double-distilled water down to 30 per cent, or 20 per cent. It should not be used in cases in which there has been serious renal damage.

#### TECHNIC

The patient should be placed in the supine position, so that the intestines may be out of the way, and the bladder should be empty. The technic of injection is skin sterilization of the site of proposed puncture. Local infiltration anesthesia is used. The solution of skiodan should be warmed to body temperature and injected through a needle into the amniotic cavity. The needle should be a three-inch flexible 19-gauge needle, such as is used for spinal anesthesia or for lumbar puncture. The site on the abdomen should be selected with reference to the fetal position, and the needle inserted where there is a maximum of amniotic fluid and a minimum of fetal parts. It should be inserted only far enough to secure amniotic fluid which is drawn up into the syringe, mixed with the skiodan, and reinjected. The patient should turn a few times after the needle is withdrawn to facilitate mixing the solution with the amniotic fluid. A good diffusion is obtained within an hour and a roentgenogram may be taken at the expiration of that time, or sooner if necessary.

The skiodan disappears slowly in the course of a few days, but the mechanism of its absorption and disappearance from the amniotic sac is not clear to us as yet. We have taken roentgenograms at daily intervals in order to note how long the opaque substance remains in the amniotic cavity. In five days it is no longer visible, so we can assume that it disappears in that time. It is not broken up so as to give off free iodine, because repeated tests for iodine in the urine proved negative. It probably passes through the amnion into the maternal circulation, although this process is difficult to conceive for the skiodan molecule is such a large one. That the baby swallows some of the substance is a possibility, according to previous workers. We have taken x-ray films of a number of babies immediately

after birth, but have not been able to visualize the stomach or gastrointestinal tract. Various experiments performed in our department on the permeability of the amnion to different substances would indicate a slow permeability for the skiodan.

The roentgenograms have been taken by Dr. Hodges and his co-workers and usually have consisted of a lateral and an anteroposterior view. An oblique exposure would, no doubt, have added other profiles of diagnostic value. Most of the anteroposterior views have been taken stereoscopically.

The chief things which can be visualized by the presence of this radiopaque material are: (1) The amniotic cavity and usually that portion which lies over the placenta; (2) the fetal soft parts, including at times the fetal adnexa, as the cord, and (3) an intensified shadow of the fetal skeleton. From these roentgenologic findings it is not difficult to infer what diagnostic possibilities the method presents.

Irregularities in the uterine cavity would be shown in the outlines of the amniotic sac. It should be possible to demonstrate tumor growths which encroach upon the uterine cavity. The placental surface can usually be shown and its position determined. This is of special value in diagnosing cases in which the presence of a placenta previa is suspected. It might be of value in abruptio placentae. The outlining of fetal soft parts assists in the diagnosis of malformations, in the locating of the small parts, sometimes in determining the sex, and the position of the umbilical cord. The skeleton stands out more clearly and this assists in recognizing the location of the small parts, in seeing developmental defects, and in fetometry. It presents a valuable means of determining changes which take place within the uterus during pregnancy and labor.

Amniography is a method to be used with caution as there are potential risks; while we have had no apparent effects from its use, our series is too small to warrant any conclusions in this regard. It is difficult to know whether or not skiodan is superior to the preparations of inorganic iodine. Some dangers of iodides have been suggested, but we have not found any recorded in the literature.

It is a method worthy of further study, as we are convinced from our own experience that close observation of the roentgenograms enables one to increase materially the amount of knowledge to be obtained.

A number of our patients were injected prior to cesarean section so that the observation at the time of operation could be compared with those found on the x-ray films.

#### REFERENCES

- Albano, G., and Gallina, E.: *Amniosgrafia: Tecnica, Biologia, Risultati*. Tipografia Agostiniani, Rome, 1932 (abstr. in *Riv. d'ost. e Ginec. Pratica* 15: 49, 1933).  
Campbell, A. M., Miller, J. D., and Menees, T. O.: *AM. J. OBST. & GYNEC.* 24: 542, 1932.  
Dicckmann, William J., and Davis, M. Edward: *AM. J. OBST. & GYNEC.* 25: 623, 1933.  
Kerr, J. M. Munro: *Operative Midwifery*, London, 1916, Bailliere, Tindall and Cox.  
Menees, T. O., Miller, J. D., and Holly, L. E.: *Am. J. Roentgenol.* 24: 363, 1930.

## DISCUSSION

DR. EDWARD L. CORNELL.—We have been injecting some animals at Northwestern University with neoskiodan and with skiodan in an endeavor to determine whether there is any toxicity of this drug associated with its use in amniography. In the first dog, we opened the abdomen and injected skiodan in varying amounts in the different fetuses. The dog promptly became very sick and within thirty-six hours showed evidences of aborting and within seventy-two hours aborted and died. The amount of skiodan we used was much larger than that used by the essayists. We have not been able to determine definitely whether the toxicity was due to the difference in construction of the lower animals from the human being. In most instances it was almost impossible to inject into the amniotic cavity of the lower animals. There is a collection of fluid between the amnion and chorion, and we inject into this fluid mostly. It may be that this is the reason for the toxicity in the lower animals.

We have tried amniography with neoskiodan only in one case so far. This patient was in active labor, and as far as we could tell, there was no evidence whatever of toxicity.

I was a little surprised that we could not see the cord in the pictures because the original pictures I saw showed the cord encircling the neck and elsewhere.

I think there must be some difference in the shadow cast by strontium iodid, as used by Menees, from that cast by skiodan and neoskiodan.

Amniography at the present moment should be used with considerable caution until we are able to determine whether this drug is toxic to the babies. The latest I have heard about strontium iodid is that there were three deaths in babies in a small number of cases. Whether these deaths were due to the toxicity of the strontium iodid or other obstetric faults it is impossible to say.

DR. ADAIR (closing).—I think Dr. Cornell is quite right in stating that this is a method which should not be used generally. Perhaps it should not be used at all. Most of our patients in whom it was used were those subjected to cesarean section. This operation was done fairly soon after the substance was injected. We did not find any evidence of toxicity in the few cases which we had, but that does not necessarily prove that it might not be toxic. In most instances the amount we used was well within the stated toxic dose for adults. We found no evidence that the fetus swallowed this substance, at least there was no shadow in the gastrointestinal tract on the x-ray films that were taken. There is no reason why the fetus could not swallow the substance. The toxicity might be less because the substance is not broken up and the iodine is not liberated in the human body. Confirmatory of that we found no iodine eliminated in the urine in the cases examined for excretion of iodine. Just how it is absorbed and how it disappears from the amnion we do not know.

I want again to emphasize that amniography is very much in its experimental stage, and I think we might well doubt its great value as a procedure. This procedure is in the literature and is being used in different places, and I think we ought to know whether or not it is dangerous, how dangerous it is, and what its real value is. I believe that in properly selected cases in which the patients are delivered soon after the substance is injected, the danger would not be very great, perhaps no more than injecting substances into the peritoneal cavity, such as we do with pneumoperitoneum. Again, I am a little skeptical as to the amount of really valuable information that we obtain from this type of procedure.

# CHLOROTHYMOL AS AN ANTISEPTIC IN OBSTETRICS\*

## A PRELIMINARY REPORT

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(From the Department of Obstetrics and Gynecology of The Long Island College Hospital)

FOR a number of years it has been our custom to use mercurochrome and tincture of iodine in the preparation of labor cases. Mercurochrome is expensive and leaves stains on bed linen that cannot be easily and satisfactorily removed. Iodine is very irritating and can be applied only after the patient has been anesthetized. Because of these disadvantages we recently began a search for an antiseptic solution that would be better suited to our purpose. The ideal antiseptic for obstetric use should kill pyogenic organisms quickly. It should be nonirritating, nontoxic and should so wet the skin that it may remain on the parts sufficiently long to kill whatever bacteria are present.

In cooperation with Dr. Arnold Eggerth of the Bacteriological Department, we have found that a very dilute solution of *Chlorothymol* in 20 per cent alcohol and 10 per cent glycerin meets the above requirements quite satisfactorily. Chlorothymol (1-hydroxy-3-methyl-4-chloro-6-isopropylbenzene) has been known for a considerable time but its insolubility prevented its acceptance as a common antiseptic.

Dr. Eggerth compared the bactericidal properties of this solution with those of other well-known antiseptics in the following manner: Blood and feces were mixed with bacterial test cultures in order that conditions similar to those found in practice might be approximated. One-half gram of feces was rubbed up in 20 c.c. of saline solution. To the supernatant liquid 1 c.c. of blood and ample quantities of *Staphylococcus aureus* and *B. coli* were added. Equal quantities of this test mixture and the various antiseptic solutions were mixed and allowed to stand for one, two, and five minutes. At the expiration of each of these intervals a loopful of the mixture was planted in broth or on blood agar plates. The effect of phenol, lysol, bichloride of mercury, iodine, mercurochrome and chlorothymol in dilute alcohol and glycerin solution is shown in Table I. One to 50 phenol, 1-150 lysol, 1-800 iodine, 1-300 bichloride of mercury and 1-2500 chlorothymol killed all of the organisms in one, two, and five minutes. One to 60 phenol, 1-200 lysol, 1-1000 iodine, 1-400 bichloride of mercury, 1-3000 chlorothymol failed to kill all organisms in one minute. Mercurochrome in less than 5 per cent strength was quite inadequate in all intervals and the 5 per cent solution killed all organisms only in the five-minute experiment. Similar tests were made with streptococci, other staphylococci, *B. pyocyaneus* and *B. coli* with favorable results. In every instance chlorothymol as dilute as 1 to 1000 killed all organisms in one, two, and five minutes.

The possibility of 20 per cent alcohol adding to the bactericidal properties of chlorothymol was investigated by comparing the effect of dilute chlorothymol with

\*Read at the New York Academy of Medicine, November 23, 1932.

various strength alcohol solutions. The same bacteria were added to a blood, feces, saline test mixture and 1-1000 chlorothymol killed all organisms in one, two, and five minutes as did 70 per cent alcohol, but 50 per cent alcohol and weaker dilutions failed to kill all organisms even in five minutes, Table II.

Following these favorable laboratory experiments clinical trial of the dilute chlorothymol alcohol glycerin solution was begun. Alternate patients were prepared in the usual manner, by spraying 4 per cent mercurochrome on the vulva every six hours during labor and swabbing the parts with half strength tincture of iodine late in the second stage. The others were prepared by the use of 1-1000 chlorothymol every six hours and 1-500 chlorothymol during the latter part of labor. In this way the same internes and nurses following a technic similar in all respects except in the matter of antiseptics delivered 328 patients. One hundred and sixty-four had mercurochrome iodine preparations and an equal number were prepared by the use of chlorothymol.

TABLE I. A COMPARISON OF VARIOUS STRENGTHS OF CHLOROTHYMOLO SOLUTION WITH VARIOUS STRENGTHS OF OTHER ANTISEPTICS. STAPHYLOCOCCUS AUREUS AND B. COLI IN THE PRESENCE OF FECES IN BLOOD WERE THE TEST ORGANISMS

PHENOL				LYSOL				IODINE			
1 MIN.	2 MIN.	5 MIN.		1 MIN.	2 MIN.	5 MIN.		1 MIN.	2 MIN.	5 MIN.	
1-40	0*	0	0	1-75	0	0	0	1-600	0	0	0
1-50	0	0	0	1-100	0	0	0	1-800	0	0	0
1-60	+	+	0	1-150	0	0	0	1-1000	+	+	+
1-80	+	+	+	1-200	+	0	0	1-1500	+	+	+
1-100	+	+	+	1-250	+	+	0	1-2000	+	+	+
CHLOROTHYMOLO				MERCUROCHROME				BICHLORIDE OF MERCURY			
1 MIN.	2 MIN.	5 MIN.		1 MIN.	2 MIN.	5 MIN.		1 MIN.	2 MIN.	5 MIN.	
1-1000	0	0	0	1-20	+	+	0	1-200	0	0	0
1-1500	0	0	0	1-25	+	+	+	1-250	0	0	0
1-2000	0	0	0	1-30	+	+	+	1-300	0	0	0
1-2500	0	0	0	1-50	+	+	+	1-400	+	0	0
1-3000	+	+	+	1-80	+	+	+	1-500	+	0	0
1-4000	+	+	+					1-600	+	+	+

\*0 indicates that all organisms were killed; + indicates that all organisms were not killed.

TABLE II. A COMPARISON OF VARIOUS STRENGTHS OF CHLOROTHYMOLO SOLUTION WITH VARIOUS DILUTIONS OF ALCOHOL. STAPHYLOCOCCUS AUREUS AND B. COLI, B. PYOCYANEUS, AND STREPTOCOCCUS IN THE PRESENCE OF FECES IN BLOOD WERE THE TEST ORGANISMS

CHLOROTHYMOLO				ALCOHOL			
1 MIN.	2 MIN.	5 MIN.		1 MIN.	2 MIN.	5 MIN.	
1-1000	0*	0	0	70%	0	0	0
1-1500	+	+	+	50%	+	+	+
1-2000	+	+	+	30%	+	+	+
1-2500	+	+	+	20%	+	+	+
1-3000	+	+	+	10%	+	+	+
1-4000	+	+	+				

\*0 indicates that all organisms were killed; + indicates that all organisms were not killed.

None of the mothers in either group died. The morbidity in each group was studied in the usual manner and 15 of the 164 mercurochrome iodine cases had a temperature of  $100.4^{\circ}$  on two successive days after the first while 16 in the chlorothymol series were similarly classified.

Among the charts which did not fall into the morbidity group were several which ran low grade temperatures for a number of days. Others had several rises above  $100.4^{\circ}$  but not on successive days. Because of the inaccuracy of the usually accepted standard of morbidity the temperature charts were placed in the following eight groups:

Group 1 included only such charts as showed a temperature curve below  $99^{\circ}$  throughout the puerperium. Thirty-seven mercurochrome iodine cases were in this group while 52 chlorothymol preparations were similarly classified.

Group 2 was made up of charts that showed only a slight rise above  $99^{\circ}$  after the first day. The ratio of mercurochrome iodine cases to chlorothymol preparations so grouped was 57 to 47.

In Group 3 the temperature never reached  $100^{\circ}$  but remained above  $99^{\circ}$  for several days. Sixteen mercurochrome iodine and 17 chlorothymol cases were included under this heading.

A temperature above  $100$  once was the basis for Group 4. It contained 11 mercurochrome and 10 chlorothymol preparations.

Group 5 consisted of temperature curves that rose above  $100.4^{\circ}$  once. Here the ratio was 10 mercurochrome iodine to 11 chlorothymol preparations.

Low grade temperature persisting for several days but generally below  $100^{\circ}$  were placed in Group 6. There were 8 mercurochrome iodine and 5 chlorothymol preparations in this class.

Temperature above  $100^{\circ}$  on two successive days after the first made up Group 7. Ten mercurochrome iodine and 4 chlorothymol patients were so classified.

Group 8 included those cases usually considered under the heading of morbidity, i.e., with temperatures above  $100^{\circ}$ ; 4 on two successive days after the first. As noted above 15 mercurochrome iodine and 16 chlorothymol preparations made up this group.

Members of the above groups whose charts might be considered those of puerperal infection constitute Group 9. Nine of these had mercurochrome iodine preparations and in 7 chlorothymol was used. A fair proportion of the temperatures in this class might have been due to extrapelvic conditions as otitis media, pyelitis, etc. The charts and histories of all cases were studied carefully in order that I might not mislead any one concerning our results, and while I do not wish to correct the figures given by deducting the extrapelvic causes of morbidity, it may be stated that were such corrections made they would favor the chlorothymol preparation.

Table III gives a summary of these groups and shows the relative frequency of the various morbidity factors that occurred in the mercurochrome iodine and chlorothymol series. More primiparas, forceps, other operations and repairs occurred in the chlorothymol cases. Accordingly these patients should have shown greater morbidity. On the contrary more good charts, 137 (Groups 1 to 5) and fewer poor charts, 27 (6 to 8) are to be found in the chlorothymol preparations. In spite

of the fact that the greater burden fell to the lot of the chlorothymol routine the results were slightly better than those following the use of mercurochrome and iodine.

TABLE III. SUMMARY OF VARIOUS GROUPS OF TEMPERATURES IN THE 164 CHLOROTHYMOLO CASES COMPARED WITH 164 CONTROL CASES

GROUP	1	2	3	4	5	6	7	8	9								
	TEMPERATURE BELOW 99° THROUGHOUT PUERPERIUM																
	ONE SLIGHT RISE ABOVE 99° AFTER FIRST DAY																
	UNDER 100° BUT ABOVE 99° SEVERAL DAYS																
	ABOVE 100° ONCE DURING THE PUERPERIUM																
	ABOVE 100.4° ONCE DURING THE PUERPERIUM																
	LOW GRADE TEMPERATURE BUT USUALLY BELOW 100°																
	ABOVE 100° ON TWO SUCCESSIVE DAYS AFTER THE FIRST																
	ABOVE 100.4° ON TWO SUCCESSIVE DAYS AFTER THE FIRST																
	POSSIBLE PUERPERAL INFECTIONS IN PREVIOUS GROUPS																
	PRIMIPARAS																
	MULTIPARAS																
	SPONTANEOUS																
	FORCEPS																
	OTHER OPERATIONS																
	REPAIRS																
	TOTAL																
			131					33									
Iodine Preparations	37	57	16	11	10	8	10	15	9	55	109	147	6	12	68	164	
Chlorothymol Preparations	52	47	17	10	11	7	4	16	7	72	92	140	11	13	75	164	
	137					27											

#### SUMMARY AND CONCLUSIONS

1. 1-500 and 1-1000 chlorothymol in 20 per cent alcohol and 10 per cent glycerin were used in the preparation of the vulva for delivery in 164 cases.

2. This solution is colorless and consequently does not stain the linen.

3. It is relatively inexpensive.

4. The patients did not complain of irritation from its use.

5. The tissue did not show any evidence of irritation.

6. Laboratory experiments indicate that the commonly used antiseptics when diluted sufficiently to become nonirritating are much less efficacious than nonirritating solutions of chlorothymol in 20 per cent alcohol and 10 per cent glycerin.

7. The clinical results in 164 cases in which chlorothymol was used were better than those following the use of mercurochrome and iodine in a control series of 164 cases in spite of the fact that a larger number of the various factors which might cause morbidity were noted in the chlorothymol group.

20 LIVINGSTON STREET

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## SPONTANEOUS RUPTURE OF UTERUS AFTER MYOMECTOMY\*

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*(From the Clinic of the Woman's Hospital)*

IN AN analysis of any suitably large series of cases of rupture of the uterus the investigator immediately will discover that a very high percentage of such casualties occurs late in protracted labors. This observation furthermore is sustained whether one considers spontaneous rupture from one cause or another or whether one is dealing with cases which are the result of ill judged or unskillful manipulation in the course of attempts at operative delivery. So dramatic as a rule is this late variety of rupture with its sudden severe abdominal pain, thready pulse, sweats, collapse and other symptoms of internal hemorrhage that one is prone to think of it as the only form and at the same time to forget that rupture can and does occur early in labor or even during pregnancy. Indeed it is into one of the two latter groups which falls the case that it is my privilege to report to you this evening, sixteen or more hours having elapsed before my colleagues and I could decide that we were dealing with such a situation. Before relating the details of the particular case which is the basis of this report I would like briefly to comment on some features of the subject more or less in the abstract. One fact with which the observer is impressed is the great variation in the ordinary incidence of rupture of the uterus in reports from various clinics. Williams in one of the earlier editions of his textbook was content to state that it occurs once in 500 to 1000 cases. In 20,000 deliveries at the Sloane Hospital it was estimated to have occurred roughly once in 1300 cases and in 60,000 New York Lying-In Hospital cases Davis found it to occur once in about 800 times. In the current "Year Book" DeLee quotes a European obstetrician who from a review of the literature and from his own observation indicates that the accident happens in the proportion of one to about 2000.

This seemingly large deviation may very likely be due to the predominant type of uterus or, in lesser degree, to the predominant type

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\*Presented at a meeting of the New York Obstetrical Society, May 9, 1933.



of bony pelvis in each individual group analyzed. Quite obviously the incidence would be much higher in uteri scarred and weakened by previous cesarean section or myomectomy than in the normal organ, whether it be in the primipara or multipara. Thus out of 184 cases of rupture reported by Davis, 24 or about 13 per cent were in the scars of previous cesarean sections, a condition which may be favorably compared to the organ upon which myomectomy has been performed. With the increased incidence of cesarean section one can predict that present-day obstetricians and their successors may be expected to encounter rupture of the uterus to fully as great, if not greater, an extent than their forefathers.

Another phase of this condition always to be stressed is its seriousness as the mortality, both maternal and fetal, ranks highest among the complications of pregnancy and labor. The immediate risk of hemorrhage and shock and the late risk of infection become grave menaces to the mother while the many hazards of protracted labor preceding the rupture and the peril of asphyxia from separation of the placenta must be met by the child. Thus Munro Kerr, writing some twenty-five years ago, lost 8 out of 10 mothers in his own personal cases, while Cragin, about the same period, reported a maternal mortality of 26 out of 30 patients. Lobenstine, reporting the New York Lying-In cases in 1909, found a maternal mortality of about 75 per cent in some 46 cases, in about half of whom the rupture was spontaneous and in the other half there was associated intrauterine manipulation to effect delivery. Most of his patients had been in labor a long while and nearly all of the ruptures occurred for one reason or another through the attenuated lower uterine segment.

During the past fifteen years about 17,500 deliveries have been conducted on both the public ward and the private service at Woman's Hospital and in this series rupture of the uterus occurred 9 times, an incidence of one in about 2000 cases. While two-thirds of our babies were either stillborn or suffered neonatal death we, at the same time, appear to have been singularly fortunate so far as the women were concerned. Only one of the 9 mothers succumbed to her complication, and she died of sepsis forty-eight hours after delivery, a maternal death rate of only 11 per cent. This is unprecedented, so far as I can find, and perhaps one of those vagaries of statistics which sometimes appears when relatively small figures are involved. In 5 of the 9 cases there were varying degrees of intrauterine manipulation, chiefly some form of version, followed in each instance by breech extraction. Five, therefore, may be regarded as traumatic and 4 as spontaneous in origin, to classify them according to one generally accepted method. Also, to demonstrate again the higher incidence of rupture in uteri previously operated upon, it was found that 4 of our 9 patients had

previously undergone either cesarean section or myomectomy. All but one of our 9 patients came to operation and, of the 8 operated upon, hysterectomy was performed in 5 and resuture was done in 3. One of the resutured cases was particularly interesting in that the rupture occurred in the scar of a previously cesareanized bicornate uterus, and, on entering the peritoneal cavity, the operator found the membranes bulging through the tear with the live fetus visible within.

The one maternal death occurred in the sole patient of the series who did not come to operation and perhaps can be set down as due to a partial or complete error in diagnosis. The sequence of events was a protracted labor; unsuccessful attempts at forceps delivery; version and breech extraction of a stillborn child; gauze packing of the lower uterine segment, cervix, and vagina for partial rupture; and death in about forty-eight hours from shock followed by fulminating sepsis.

*Case Report.*—One rather singular finding in this series of 9 ruptured uteri was that no surgeon involved had the accident happen to more than one of his patients, each patient having been under the supervision of a different man. That feature, of course, applies to my own case which happened in a vigorous and healthy-looking primigravida in her late twenties. She first consulted me in the twenty-fifth week of her pregnancy and her history for the most part was negative or irrelevant except for one operation. Four months before her last menstruation or, in other words, about thirteen months before what subsequently proved to be the date of her confinement, she was operated upon for fibromyomas of the uterus. This operation was performed elsewhere by another surgeon and an extensive myomectomy and a prophylactic appendicectomy were done. Except for an inordinate degree of abdominal pain and discomfort which varied greatly both in point of time and intensity and which often required repeated doses of codeine for alleviation her pregnancy was comparatively uneventful. She went through practically to full term and about two o'clock one afternoon within a week of her expected date of confinement she was seized with excruciatingly severe continuous epigastric pain. Two hours later she reached the hospital and, because of the uninterrupted severity of her pain, was unable to walk comfortably and had to be taken to her room in a wheel chair. The temperature, pulse, and respiration were normal. When once settled down in bed she acted much like the average primipara, having mild five-to seven-minute contractions of first stage labor, except that there was not the usual let-up between pains. Always she suffered some discomfort in the upper abdomen and chest and even in the shoulders and several times she vomited from an almost constant sense of quite appreciable nausea. In the course of her first and only vaginal examination four hours after the onset of labor the membranes were accidentally ruptured and the cervix found to be effaced and dilated some 5 or 6 cm. The fetus was found to be presenting by the breech and from this point on labor progressed quite normally, except for a continuation and increased severity of the epigastric and thoracic pain, until she was delivered of a living female child by perineotomy and breech extraction, the total duration of labor amounting to eight and one-half hours.

Immediately upon delivery of the child the anesthetist reported that the patient's pulse had gone up to 140 and, suspecting some possible injury to the lower uterine segment, the interior of the organ, except the very summit where the placenta was still attached, was explored with the gloved hand. No trauma was noted this time but, to make doubly sure, another exploration was made after repair of the

perineotomy and delivery of the placenta. By this time the uterus had so contracted down with pituitary extract hypodermically that only the index and middle fingers, and not the entire hand, could enter and reach beyond the contracted cervix. Consequently the top of the fundus could not be palpated.

The mild syncope and rise in pulse rate noted on the table were of short duration and, after she had been changed from the lithotomy to the supine position and the fundus had contracted firmly, the patient reacted well and the blood pressure, just before she was returned to her room, was 100 systolic. She apparently continued to improve for an hour or two, was able to talk with her husband, and was shown her baby. But, as a precautionary measure, a hypodermoclysis of 1000 c.c. of 3 per cent glucose solution was given.

When fully awake the patient was found to be still complaining of the same pain in her upper abdomen, breasts and shoulders that she had during labor and, about two and one-half hours after delivery, I was hurriedly summoned to her bedside to find her in a state of mild collapse with pulse 140 or more and rapid "air hunger" type of respirations. Symptoms pointed to internal hemorrhage but, in the face of the two seemingly negative explorations of the uterus, I could not at first give the diagnosis of rupture very serious consideration. As time went on, however, signs became more and more suggestive of that condition until a point was reached when the diagnosis was unmistakable and laparotomy became necessary. The patient received intravenous gum glucose solution and various cardiac stimulants interspersed with generous quantities of sedative. A blood transfusion was under way when the abdomen was opened through the former scar in the midline below the umbilicus. Much free and clotted blood was immediately encountered and a complete rupture of 2½ inches was noted on the upper and anterior surface of the fundus. A rapid supravaginal hysterectomy was performed and, with a concurrent blood transfusion of 900 c.c. successfully completed, she left the table in tolerably good condition. The early days of her convalescence were stormy but she did well eventually and left the hospital with her infant in a little over two weeks.

Histologic examination showed the rupture had taken place through the bed of the former myoma.

There is little or no doubt in my mind that the rupture took place at the very beginning of labor. Indeed it may have been solely the pain associated with the rupture which caused the patient first to summon aid and that labor was precipitated as a result of the accident. A rare opportunity was therefore presented to observe a woman with a ruptured uterus continuously for seventeen hours or more of labor, postpartum shock, and hysterectomy without leaving the hospital and scarcely even leaving her bedside.

This case demonstrates the observation that rupture can and does occur early in or before the onset of labor and that in so doing the symptoms may at first be mild or only moderately severe, thereby obscuring the diagnosis. It emphasizes also the great value of manual exploration of the interior of the uterus for possible injury where collapse on the delivery table points to that diagnosis or where there has been traumatizing operative work, manual or instrumental, incident to delivery. It shows furthermore the value of operative interference in rupture of the uterus as soon as the diagnosis is established with a reasonably fair degree of certainty and suitable arrangements for blood transfusion, preferably before or during operation, are made. This point is well taken if our 9 cases at the Woman's

Hospital are any criterion as all the 8 women who were subjected to prompt surgical intervention survived. Again referring to this small series we find, as before noted, that 3 of the 8 were resutured while hysterectomy, the generally accepted operation of choice, was performed on 5 patients, including my own. My case would have been a simple one for resuture from the technical standpoint, and I was somewhat tempted to do it, but went on with the hysterectomy after briefly weighing in my mind the possible eventualities, namely, hysterectomy with loss of menstrual and childbearing function, but with less chance of death from infection and resuture of a potentially infected uterus and a greater hazard of maternal mortality. As it turned out the patient and her baby are today alive and well but I have frequently speculated as to what would have happened to her had I resutured the rupture in an effort to save the uterus.

37 EAST SIXTY-FOURTH STREET

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## EARLY DETECTION OF CHORIONEPITHELIOMA BY MEANS OF THE ANTERIOR PITUITARY HORMONE TESTS, WITH REPORT OF A CASE

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SINCE chorionepithelioma is of chorionic epithelial origin, there has come into the realm of laboratory procedures a method for its detection. The Aschheim-Zondek test and its modifications depend upon the presence of anterior pituitary hormone in the urine. However, while it takes 1 c.c. of urine to give a positive Aschheim-Zondek test in pregnancy, only 1/50 c.c. of urine is required to give a positive test in hydatid mole, and only 1/100 c.c. in chorionepithelioma. Thus a method of differentiation suggests itself. According to Anspaeh, 50 per cent of chorionepithelioma follows hydatid mole. The prognosis is bad in 80 per cent of cases, but in the individual case the earlier the operative procedure is instituted the better the prognosis.

There are about 45 cases of hydatid mole reported in the literature which have been followed or diagnosed by the Aschheim-Zondek test or its modification, and nearly as many cases of chorionepithelioma have been followed in the same manner with gratifying results.

### CASE REPORT

Mrs. E. B., aged twenty-eight. First admission to St. Joseph's Hospital, Feb. 11, 1932. Patient's chief complaint was vaginal bleeding, nausea and vomiting, and excessive weight of uterine enlargement. Patient's last regular menstrual period occurred on Oct. 6, 1931. Previous period was on Sept. 4, 1931. The present vaginal bleeding started about Jan. 12, 1932, was spontaneous in origin, and moderate in amount; 2 to 3 napkins a day. The patient was placed abed, and the vaginal bleeding ceased. Since that time the patient has complained of slight bleeding every other day up until three or four days ago, when the patient began to bleed ex-

cessively. She was placed abed once again and told by her family physician that she was about to have a miscarriage. The physician then inserted tampons into the vagina. Patient stated that this pregnancy was much heavier than her first, for the corresponding period of time. There was nothing else remarkable in the history except that the patient began to vomit in November, 1931, which has continued up to the past week.

She had been married four years, had one child, now eighteen months old; a normal birth. No miscarriages.

Physical examination showed a poorly nourished and developed white female, markedly anemic and with an anxious expression. Colostrum could be expressed. A nontender mass in the abdomen extended to the navel. There was vaginal bleeding.

Rectal examination revealed several hard masses in the vagina, and the cervix was about 1 finger's breadth dilated. A diagnosis was made of inevitable abortion.



Fig. 1.



Fig. 2.

Fig. 1.—Uterine curettings March 30, 1932, chorionepithelioma (early). A typical proliferation of syncytial and Langerhans layers.

Fig. 2.—Chorionepithelioma of uterus April 23, 1932. Representing the tumor mass described in fundus of the uterus following the panhysterectomy.

At 10:30 P.M. of the day of admission, the patient had severe cramplike pains in the abdomen and passed by vagina several tampons and a very large amount of a "tapioca-like" substance.

An Aschheim-Zondek test was started on urine obtained the next morning which gave a positive reaction in the regular urine dosage, and also in the 1/50 c.c. dilution, which suggested hydatiform mole.

On February 13, a dilatation and curettage of the uterus was done and many grapelike bodies were removed. Urine collected four days postoperative, Feb. 17, 1932, and reported February 22 gave a positive Aschheim-Zondek reaction. On the twenty-third day of February an Aschheim-Zondek test gave a negative reaction unexplainable considering what followed.

As follow-up, a specimen of urine was collected one month later on March 26. A Friedman (rabbit) test was done and this revealed a strongly positive reaction.

Because of the positive test for anterior pituitary hormone in the urine, the patient was readmitted, even though symptomless, on March 30 for a dilatation

and curettage. We believed that the mole was not completely evacuated at the first operation. At this time the uterus was found to be about twice its normal size. The curettings revealed only a small amount of material and no grapelike or tapioca-like particles. The pathologic report at this time revealed marked atypical proliferation of the syncytial and Langerhan's layers. This picture (Fig. 1), coupled with persistent positive Aschheim Zondek test, led us to advise panhysterectomy, which was done on April 23. No gross pathology was evident at operation. The patient made an uneventful recovery.

*Pathologic Report.*—The uterus did not appear enlarged or unusual. The endometrium presented a very slight thickening, but otherwise was not remarkable except for a tiny area of dark discoloration about 2 mm. in size, situated in the center of the highest point in the fundus. Longitudinal section of the uterus and cervix was made through this area. On section, beneath this area, there was an

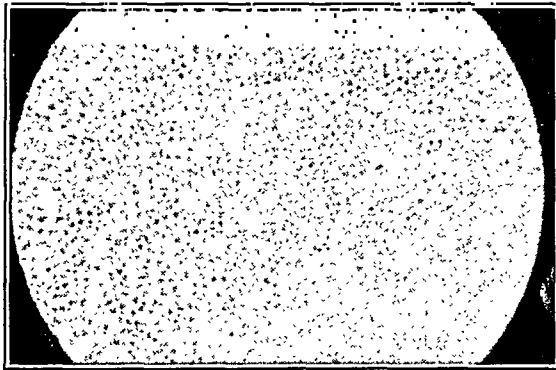


Fig. 3.—Chorionepithelioma of uterus April 23, 1932. Area surrounding the small tumor mass in the fundus of the uterus. The tumor mass is completely separated from any identified uterine musculature by a thick wall of lymphoid cells. Section shows lymphoid cells adjacent to uterine musculature.

hemorrhagic spot firm in consistency, mottled with tiny pearly areas 6 mm. in diameter, with the greater portion embedded into the uterine musculature and a very small portion reaching the deeper layers of the endometrium. The tubes and ovaries presented nothing unusual. Microscopic examination showed chorionepithelioma. There was no evidence of metastasis found in tubes or ovaries. Figs. 2 and 3 showed the microscopic pictures. May 5, 1932, x-ray of the chest was reported negative.

On June 2, 1932, and on July 10, 1932, follow-up Aschheim-Zondek tests gave negative reactions. Six months later, a third follow-up test, also gave a negative reaction. To date (August, 1933) the patient has remained well.

I desire to thank Dr. Constable for the microphotographs, and Drs. Coughlin and McQuirk in whose service the case occurred.

255 THAYER STREET

## TWO CASES OF CALCIFICATION OF THE UTERUS ASSOCIATED WITH MISSED OR INCOMPLETE ABORTION\*

FRANK R. SMITH, M.D., F.A.C.S., NEW YORK, N. Y.

CASE 1.—M. R., twenty-nine years of age, recently divorced, complaining of persistent leucorrhea for eleven years, and irregular menstruation for three years.

Abortion was induced in November, 1921, after three missed periods, the preceding period being scanty.

Abortion said to have been performed in one stage under complete ether anesthesia. Because of persisting bleeding the patient was again curetted under complete anesthesia in January, 1922. The bleeding gradually diminished but leucorrhea persisted.

Patient was married in 1923. Curettage and cauterization of the cervix for leucorrhea and endocervicitis was done in January, 1930. The leucorrhea persisted. In August, 1932, she was cauterized for cervicitis with leucorrhea, without anesthesia. No curettage done.

First seen by me in September, 1932. The uterus was slightly enlarged, symmetrical, firm, and in good position. The vagina was inflamed and tender; the cervix was swollen and showed three superficial stripes of a recent cauterization. The vaginal discharge was very profuse and frothy. *Trichomonas vaginalis* in abundance showed in smears. No gonococci were present. Biopsy of the cervix showed endocervicitis with no evidence of malignancy. I believed that the etiologic factor was to be *Trichomonas vaginalis* with an acute vaginitis following the recent cauterization. Conservative treatment for three and a half weeks with peroxide douches twice daily and green soap tampons twice weekly quieted the acute vaginitis but the cervix still remained bulky, infected, and eroded.

On Sept. 26, 1932, under nitrous oxide-oxygen anesthesia, the cervix was dilated and cauterized. The interior of the uterus was explored with a curet and the entire canal was gritty. A few scanty curettings were obtained with difficulty. Also a flat scalelike piece of bone was extracted with the curet but no other uterine contents were obtained.

The curettings showed calcified uterine muscle with appearance of a calcified myoma. One small area showed endometrial glands. There was one piece of trabeculated bone  $1\frac{1}{2}$  by 1 cm. Roentgenologic diagnosis was "probably a calcified fibroid."

On Nov. 8, 1932, under ether anesthesia, an abdominal hysterectomy to include corpus and cervix was performed. The ovaries were conserved. Examination of the uterine cavity showed the bones of a fetal skull, collapsed, but which had cut and pressed their way into the left uterine wall. They were closed over in much the same manner as a fertilized ovum burying itself in thickened decidua uterine lining (Fig. 1). Microscopic examination failed to show other fetal or decidua tissue.

The leucorrhea cleared up after the operation.

We have here a twenty-nine-year-old woman with a history of only one (four to four and one-half months') pregnancy eleven years previously, supposedly terminated by induced abortion, and symptoms of leucorrhea and irregular bleeding for which repeated curettages and cauterizations of the cervix had been performed,

\*Presented at a meeting of the New York Obstetrical Society, March 14, 1933.

who was cured by removal of a calcified uterus containing a false cavity in which the bones of a collapsed fetal skull were found. The blood calcium was slightly elevated. *Trichomonas vaginalis* appeared in abundance in the vaginal discharge.

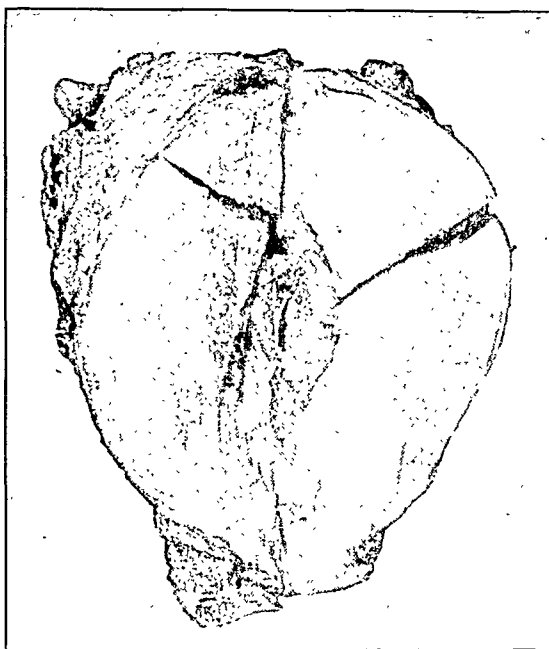


Fig. 1.—Showing uterus containing bones of fetal skull.

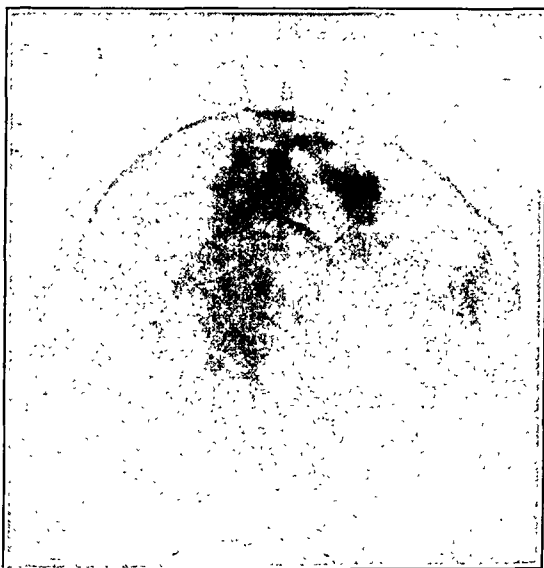


Fig. 2.—Skiagraph of lower abdomen showing calcified uterus containing skull and long bones of fetus.

CASE 2.—C. R., fifty-seven years of age, Russian, married woman came to the Memorial Hospital on Nov. 19, 1932, complaining of the weight of an abdominal tumor, and increasing obstipation. She had 3 children, youngest eighteen years of age.

Fifteen years ago, at the age of forty-two years, the patient said she received "for bleeding tumor of the womb, x-ray treatments at various hospitals, one of



which was Memorial Hospital." The last treatment was said to have been given twelve years previous. No record of this case had been found at Memorial, but the patient's abdomen and back showed definite telangiectasis. One year ago she was found to have diabetes and a high blood pressure. She had been treated for these complaints at several clinics.

For the past six months there had been a progressively increasing, fairly constant pain across the lower abdomen associated with a sensation of downward pressure in the pelvis. Constipation was increasing. The sensation of pressure was greatly increased if the patient lay on the left side.

Abdominal and pelvic examination revealed a stonelike, globular, fairly movable tumor mass reaching slightly above the umbilicus and consistent with the body of the uterus. It has not been found at Memorial Hospital that calcification may normally follow irradiation therapy of the uterus.

A skiagraph of the lower abdomen revealed a calcified uterus containing the skull and long bones of a fetus. The patient refused to have anything done. She is being treated for diabetes at another hospital where her blood sugar on Nov. 21, 1932, was 280 mg. per cent. Blood calcium has not been done. Patient has refused to report for a Wassermann test. She has no recollection of missed periods before the x-ray treatment.

In this instance a fifty-seven-year-old Russian woman with an apparently missed or threatened abortion, diagnosed incorrectly as a fibroid, was treated by x-ray without exploration of the interior of the uterus, resulting in a calcified uterus with a missed abortion of fifteen years' duration.

The rarity of the condition is offered as the justification for reporting these two cases.

## DISCUSSION

DR. I. C. RUBIN.—In a case of mine eighteen years ago, a similar crepitation in the uterus was noted. The patient, twenty-five years of age, gave a history of an amenorrhea of three months, and then miscarried. She remained sterile for seven years and complained of dysmenorrhea. Upon bimanual examination a sensation of crepitation was elicited in the uterus. On introducing a sound, grating was elicited. By curettage two small slender shanks of bone were removed and fragments of calcified endometrium. Under the microscope there were seen to be scales of young bone imbedded in the endometrium. There is no doubt that bones of a young embryo can be retained by the uterus for a long time, and it may evoke further osteogenic production. The same thing occurs in the ovary and osteomas of the ovary are very well known. Whether or not they arise as the result of ectopic pregnancy is debatable. I have one case of that type of bone formation in the tube which I feel may have arisen on the basis of a tubal pregnancy and may be regarded as a sort of lithopedian formation.

DR. W. P. HEALY.—I wish to draw attention to one point; that is, in observing cases of fibromyoma of the uterus treated by radiation therapy, over a long period of years, we have failed to observe calcification as in any sense a sequel to this form of treatment. Therefore, when this patient with a large tumor came into our clinic last fall, and we found this what seemed to be on bimanual examination, a very huge calcified myoma, at once the question naturally arose as to why it was calcified. The x-ray pictures explained what we were dealing with. I believe that, when she was irradiated with roentgen ray probably she had a dead fetus. She was along in years at that time (over forty), and I think it was an honest error of judgment in the different institutions where she was treated for her huge tumor, which was always regarded as a myoma.

## ABSENCE OF URETHRA DUE TO OBSTETRIC TRAUMA\*

FREDERICK C. HOLDEN, M.D., NEW YORK, N. Y.

MRS. U. M., aged thirty-nine, was admitted to Bellevue Hospital complaining of complete incontinence of urine. Her past history was negative. Her weight for the past two years had been about 205 pounds, previously it was 160 to 170. She was a hard worker and was on her feet all day. Menstruation established itself at fourteen, and had continued every twenty-eight days since, was of two to three days' duration, and she suffered no pain. The last regular period was Sept. 23, 1931. She had complete control of her urine up to the birth of the last baby, April 22, 1931, and had had complete incontinence since. The use of laxatives regulated the bowels. She was gravida x and para x, the first delivery being in 1912 and the last, April, 1931. All babies were in good condition except the last, which died during delivery. The seventh and last pregnancies were instrumental deliveries, all others were spontaneous, with normal puerperia after all except the last, which terminated in a prolonged and difficult labor of three days' duration, followed by

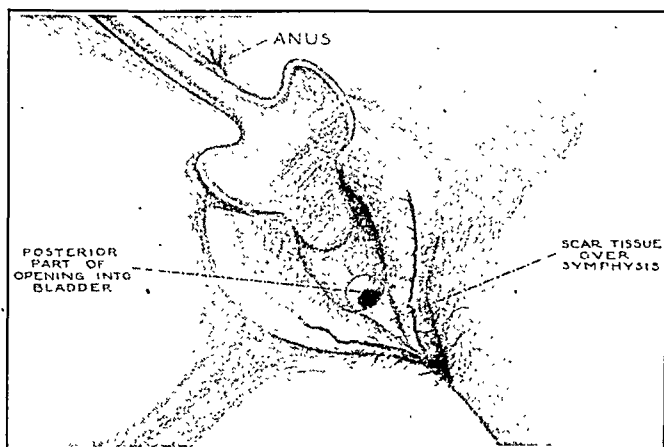


Fig. 1.

an apparently difficult and traumatic attempted delivery at home. The report from Trinity Hospital where this patient was subsequently admitted, states that "The patient was admitted by our ambulance surgeon on March 22, 1931, with a history of the head of the baby still floating in the uterus, the body having been torn off before our ambulance surgeon arrived. The head was then removed without any difficulty. Progress notes distinctly indicate that there was an incontinence of urine, and proper treatment was instituted. The existing cause of the incontinence was not definitely determined because the patient insisted on going home against advice. In the presence of existing conditions of foul lochia, temperature, and definite signs of parametritis, a cystoscopy was not deemed advisable. The patient was discharged with diagnoses of laceration of the perineum (third degree); bilateral sulcus tear and laceration of the cervix extending through the fornix."

On admission to Bellevue Hospital, general examination of the patient was negative except for obesity. Her height was 5.7 feet; weight, 190 pounds and abdominal girth, 44 inches. Examination showed an old laceration of the pelvic floor with moderate rectocele. The cervix was short and behind the symphysis. The fundus

\*Presented at a meeting of the New York Obstetrical Society, March 14, 1933.

was regular in contour, apparently not enlarged. No adnexal or parametrial pathology was palpable. The urethra was entirely destroyed, from the external sphincter to the neck of the bladder, and there was no soft tissue on the posterior aspect of the symphysis. The entrance to the bladder was through an opening behind the symphysis 2 cm. in diameter, through which there was a steady flow

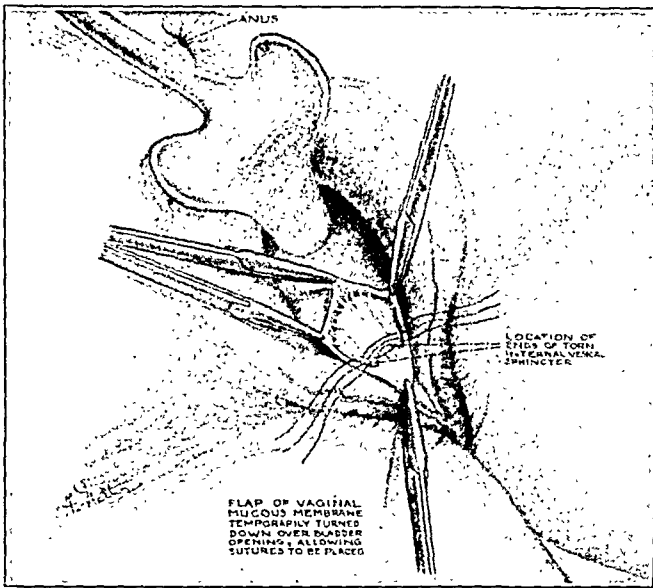


Fig. 2.

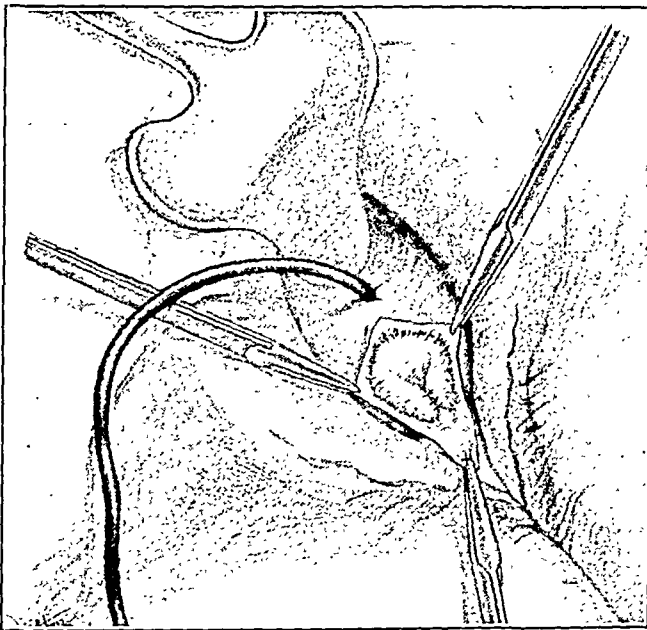


Fig. 3.

of urine. Cystoscopic examination showed the trigone and urethral orifices to be normal. The bladder capacity was diminished to four ounces and the vesical outlet was edematous. No other openings or diverticulas were observed. Two consultants agreed that they did not believe that any vaginal plastic operation could give her continence of urine, since no part of the urethra was left. Both agreed that the

Coffey operation was the only possible procedure, but stated it would be very difficult to carry out because of the adiposity of the abdominal wall. On Oct. 5, 1931, a vaginal operation was performed. The patient was placed in the Sims' position, the catheter inserted into the bladder opening and left there. A horse-shoe shaped incision was made through the mucous membrane in the anterior vaginal wall,  $\frac{1}{2}$  inch posterior to the bladder opening (Fig. 1). The mucous membrane was dissected from the fascia in front of the neck of the bladder. Four interrupted sutures were taken in the prevesical fascia in such a way as to tighten the fascia in a longitudinal fashion (Fig. 2). Before these sutures were tied, one blade of a sponge stick was introduced into the bladder through the opening, the clamp closed, and an artificial opening made through the vesicovaginal tissues so clamped, creating a vesicovaginal fistula posterior to the bladder opening being repaired. A mushroom catheter was then inserted through this vesicovaginal fistula, and sutured in place. Then the fascial sutures were tied (Fig. 3), and the mucous membrane closed with several interrupted sutures. The patient made an uneventful recovery and was discharged Nov. 20, 1931.

Follow up: The patient was seen again on Jan. 16, 1932, at which time she could hold her urine for two or three hours at a time, both day and night, and lost a very slight amount, only on rising from a chair, otherwise she had no leakage. In order to give better bladder support, however, a posterior colporrhaphy was done on April 16, 1932. A year later the patient reported complete urinary continence, has to void every two or three hours during the day, but has no nocturia.

#### DISCUSSION

DR. G. G. WARD.—I desire to report a similar case. Mrs. E. H., aged twenty-six years, married six years. Had her only labor in September, 1928, full term, difficult forceps delivery, resulting in a vesicovaginal fistula. Baby born dead. She was operated upon by the physician who delivered her eight times, without success. I operated upon her on Nov. 22, 1932. The findings were a complete loss of the urethra with the exception of the external meatus which was still present as a little flap of tissue, but the urethra was entirely gone, and at the site of the internal meatus was a circular fistula about  $\frac{1}{2}$  cm. in diameter.

An incision was made on the anterior vaginal wall above the fistula outlining a square flap one inch wide and one inch long, this flap was dissected from the vaginal wall up to the fistula leaving it attached. This flap was then formed into a tube by suturing the margins together after the technic suggested by Farrar, a soft rubber catheter was then passed through this tube and into the bladder through the fistula. The site of the old urethra was dissected out forming a deep groove and the newly constructed tube was laid in the groove, and its end with the catheter was brought out of the external meatus which remained and sutured to it. The margins of the groove were then undermined and brought together over the urethral tube and sutured with silver wire sutures. A Kelly mattress stitch of linen was then passed at the neck of the bladder for control and the edges of the incision united with silver wire sutures.

The result of the operation was very satisfactory in so far that we obtained primary union, and were you to examine the patient today I am quite certain none would know that she had lost her urethra. She passes urine through the natural channel without any trouble.

## THE BIRTH OF A GIANT FETUS

JOHN E. HOBBS, M.D., AND WILLARD SCRIVNER, M.D., ST. LOUIS, MO.

*(From the Department of Obstetrics and Gynecology, Washington University School of Medicine, St. Louis Maternity and Barnes Hospitals)*

A SURVEY of the literature shows comparatively few authentic cases. In 1897, Dubois<sup>1</sup> found 28 instances in which the baby weighed 5600 gm. or over and concluded that fetuses weighing more than six kilograms are very rare. V. Winckel<sup>2</sup> states that in 30,000 deliveries he has never noted a baby weighing over 6000 gm. In 1917, Davis<sup>3</sup> stated that the largest baby delivered in the New York Lying-In Hospital weighed 15 pounds, although over 100,000 cases had been confined there.

We have found in the literature nine cases reported by the following observers in which the weight exceeded that of our case: Belcher<sup>4</sup> (25 pounds); Moss<sup>5</sup> (24.12 pounds); Ortega<sup>6</sup> (24.82 pounds); Neumer and Rachel, quoted by Williams<sup>7</sup> (24.8 pounds); Beach<sup>8</sup> (22.75 pounds); Robbins<sup>9</sup> (17.5 pounds); Brechin<sup>10</sup> (18.37 pounds); Trumbull<sup>11</sup> (18.25 pounds); and Gordon<sup>12</sup> (18 pounds).

L. B., a negress, aged forty, gravida xiii, para xiv, presented herself for the first time in the Washington University dispensary on July 27, 1932. She had delivered spontaneously thirteen full-term babies including a set of twins. She estimated the babies to weigh around eleven pounds each and collectively for the twins. However, her previous baby born in the St. Louis Maternity Hospital in March, 1929, weighed but 4975 gm.

Her last menses occurred from January 9 to 13, 1932, with a previous normal period in December.

Physical examination revealed an obese colored woman weighing 208 pounds without any evidence of disease. Blood pressure normal. Urine, blood Wassermann and Kahn were negative. Pelvic measurements were normal.

The estimated date of confinement was Oct. 16, 1932. She returned in August and September, and it was found she had not gained in weight despite a normal intake of food. In September, the MacDonald measurement was 35 cm. with the head at the spines. The patient did not report until 3:00 A.M. October 21, 1932, at which time she called the out-patient physician and stated she was in labor. Three hours later, the membranes ruptured spontaneously. The fundus at this time measured 50 cm. with the head above the spines. The patient stated her abdomen had increased tremendously in size during the last month. The fetal heartbeat could not be heard nor had the patient felt movements for the past two days. At six in the evening the head was born spontaneously and attempts to complete the delivery were unsuccessful because of the shoulder impinging on the symphysis. The patient was brought into the St. Louis Maternity Hospital where the delivery was completed by the resident house officer, the child being stillborn. The shoulders were maneuvered so that both were delivered posteriorly. There was considerable amniotic fluid lost in the home and following the extraction of the baby, but it was not measured. The placenta came away readily and weighed 1100 gm. A small cervical tear was repaired and the patient returned to the ward in good condition.

The first few days of the puerperium were complicated by a low grade fever and foul smelling lochia. On the sixth day, an intrauterine culture and douche were done and the temperature returned to normal in the next few days. The remainder

of the puerperium was uneventful, except for a vesicovaginal fistula, which developed late in the puerperium. The patient was discharged from the hospital on the nineteenth day in good condition.

The baby, a male, weighed 7700 gm. (16.94 pounds), without any malformations. The following measurements were made:

	<i>Cm.</i>	<i>Inches</i>
Length	62	24.41
Length of torso and head	38	14.96
Circumference of thorax	42	16.53
Circumference of abdomen	39	15.35
Bisacromial diameter	21	8.22
Bitrochanteric diameter	13.5	5.31
<i>Head Diameters:</i>		
O. F.	11	4.33
S. O. F.	10.5	4.13
S. O. B.	10	3.93
B. P.	10	3.93
B. T.	9.5	3.74
O. M.	15	5.90
<i>Head Circumferences:</i>		
O. F.	36	14.17
O. M.	40	15.74

The head was not unusually molded. The sutures and fontanelles were normal for a full-term fetus and the cranial bones showed no increase in density. There was no evidence of intracranial hemorrhage. The brain was degenerated and very friable, the falx and tentorium intact. The sella turcica measured 1.5 by 1.2 cm. The removed pituitary measured 1 by 0.5 by 0.5 cm., no gross abnormalities.

On opening the thoracic cavity, there was a small amount of blood-tinged fluid. The thoracic viscera presented a normal relationship. The lungs combined weighed 137 grams. The heart measured 6 by 8 by 5 cm. and weighed 67 grams, the right ventricle 1 cm. thick, the left 1.5 cm. The foramen ovale was partially occluded. The thymus weighed 35 gm. The thyroid measured 2 by 1 by 1 cm. There was a small amount of blood-tinged fluid in the abdominal cavity, all of the organs in their normal relationship. The ligamentum teres and urachus were quite large. The liver weighed 310 gm. and measured 17.5 by 11 by 3 cm. There was a rupture of the right lobe, most likely traumatic in origin. The caudate lobe was well developed. The spleen weighed 25 gm., measured 7 by 5 by 1 cm. and congested on cut section. The pancreas weighed 10 gm., measured 5 by 2 cm. The kidneys combined weighed 35 gm. and showed the normal fetal lobulations. The adrenals together weighed 22 gm., measured 4 by 5 by 1 cm. and showed no evidence of hemorrhage. The gastrointestinal tract showed no gross abnormalities.

The testes were in the scrotum, the penis normally formed.

Microscopically the pituitary showed considerable degenerative changes with increased vascularity. Heidenhain's iron hematoxylin stain showed the eosinophile to be the predominating cell. The lungs showed atelectasis with some meconium-like material in a few of the alveoli and considerable degeneration. The other organs showed a normal picture of fetal tissue with considerable postmortem degeneration.

A roentgenologic study showed normal centers of ossification as would be expected in a full-term, nonpostmature child.

Babies at birth weighing over 6000 gm. are extremely rare and one should be very skeptical of reports of excessively large fetuses without absolute evidence. Nine cases have been reported in which the weight of the newborn has surpassed the weight of our case, but none of these cases had a complete necropsy and

roentgenologic study as our case has had. With the evidence we have presented, surely the authenticity of this case cannot be regarded with skepticism. In this case, we have had a rare opportunity to study the endocrine glands with the idea that an endocrinopathy might be an etiologic factor in the production of such large babies, but we are unable to adduce any facts supporting this concept.

## REFERENCES

- (1) *Dubois*: Les Gros Enfants au Point de Vue Obstetrical, 1897. (2) *F. Winckel*, F.: Klinische Vorträge, N. F. 292-293, p. 175, 1901. (3) *Davis*, quoted by *Brodhead*, G. L.: Am. J. Obst. 75: 993, 1917. (4) *Belcher*, D. P.: J. A. M. A. 67: 950, 1916. (5) *Moss*, E. L.: Brit. M. J. p. 643, 1922. (6) *Ortega*, F.: Nouvelles Arch. d'obst. et de gynec. p. 481, 1891. (7) *Williams*, J. W.: Ed. 6, 1930, p. 168. (8) *Beach*, A. P.: Med. Rec. 15: 271, 1879. (9) *Robbins*, L. H.: Trans. A. M. A. 33: 231, 1882. (10) *Brechin*, W. P.: Med. Rec. 24: 707, 1883. (11) *Trumbull*, J.: Med. Record 35: 656, 1889. (12) *Gordon*, E.: Brit. M. J. 1: 664, 1884. (13) *Adair*, F. L., and *Scammon*, R. E.: AM. J. OBST. & GYNEC. 2: 35, 1921. (14) *Brothers*, A.: Am. J. Obst. 33: 528, 1896. (15) *DeLee*, J. B.: Principles and Practice of Obstetrics, Chap. LI, 1928, p. 682. (16) *Oyamada*, M.: Beitr. z. Geburtsh. u. Gynäk. 17: 93, 1911. (17) *Ahfeld*: Arch. f. Gynäk. 4: 510, 1872. (18) *Lewis*, E. R.: Boston M. & S. J. 119: 543, 1888. (19) *Editorial*: J. A. M. A. 62: 382, 1914.

## SPONTANEOUS RUPTURE OF UTERUS WITH A SEVEN MONTHS' PREGNANCY\*

ALFRED A. SCHENONE, M.D., BROOKLYN, N. Y.

(From the Obstetrical Service of St. Catherine's Hospital)

THIS case is reported because of the relative infrequency of spontaneous rupture of the uterus without labor, and also because of the possible etiologic factors in its causation.

Mrs. M. K., white, aged thirty-one, gravida v, para ii, admitted to St. Catherine's Hospital July 25, 1929, in the seventh month of her pregnancy, complaining of mild lower abdominal pain. She believed herself in labor. She had been married ten years, had 2 spontaneous abortions, 2 full-term pregnancies, both labors instrumental, one a stillbirth. Appendectomy had been done fourteen years previously. Another laparotomy with a midline incision was done six years previously to above admission for what patient described as "cyst on left ovary." Husband later claimed this was for a tubal pregnancy. No hospital record of this operation was obtainable. A curettage for incomplete abortion was done in 1926.

Last menstrual period Dec. 19, 1928, estimated labor Sept. 25, 1929. Pregnancy proceeded normally except for moderate headaches at third month. Patient was first seen in early part of July, 1929, three weeks prior to admission, when she complained of more or less constant, though vague pain transversely across lower abdomen. Patient, however, was up and about at this time. Physical examination revealed two well-healed operative scars on abdomen, which was enlarged to size of a six or seven months' pregnancy. There was slight tenderness in the left lower quadrant midway between umbilicus and left anterior superior spine. Pain had existed for the past two weeks. Blood pressure was 120/78; pulse, 80. Fetal heart was audible in right lower quadrant, rate about 140. Patient was seen again one week later, complaining of same pain in lower abdomen especially on left side.

\*Presented at a meeting of the Brooklyn Gynecological Society, December 2, 1932.

Physical findings at this time were the same. A diagnosis of postoperative adhesions with stretching due to progressive enlargement of the uterus was made at this time.

A rectal examination on admission revealed a closed cervix, membranes presumably intact, with the vertex high. The dorsum was felt on the right and the fetal heart was audible in the right lower quadrant, rate 164.

Pelvic measurements were normal; blood pressure, 120/82 at 8:00 A.M.; pulse rate, 88; temperature, 98.4°. There was no bloody show at this time. Impression was that patient was experiencing the same sort of pain when seen in early part of July, 1929, and was not in labor.

Vague, irregular pains again came on two hours later, mostly in lower half. A marked change in patient's appearance was noted an hour later. There was some pallor of face. A blood count showed 2,500,000 red cells, with Hb. 55 per cent. Her general condition became decidedly worse. No vaginal bleeding was present. Abdomen was moderately tender to touch and also distended throughout. Blood pressure was 100/80. A diagnosis of ablatio placentae was made by the house surgeon at this time.

Patient was seen by a consultant an hour later. Vaginal examination showed cervix closed, elongated, thick, and cicatricial, barely admitting one finger. There was no vaginal bleeding. There was no presenting part low enough to feel through the cervix. Diagnosis: ablatio placentae. Patient's general condition was so poor at this time that any manipulation for delivery was contraindicated. Supportive measures consisting of clyses, heat to the extremities, and morphine were given. Shortly afterward patient died.

An immediate postmortem section was done. The peritoneal cavity was found full of free fluid blood, while a seven months' dead fetus enclosed in intact membranes floated freely in abdominal cavity. The placenta was likewise lying freely in the abdominal cavity. The opening in the uterus extended across the entire length of the fundus from one cornu to the other. No gross evidence of a previous myomectomy or salpingectomy was found.

*Comment.*—(1) The absence of labor with spontaneous rupture of the uterus constitutes an unusual feature in this case. (2) Although a laparotomy had been performed some six years prior to the time of rupture, no gross evidence of uterine or tubal pathology was noted at the postmortem section. (3) The clinical picture presented by this case was highly suggestive of an ablatio placentae. (4) The only tangible factor in the etiology of the rupture seems to be connected with the dilatation and curettage performed three years previously for an incomplete abortion.

2041 EAST SEVENTEENTH STREET



## CARCINOMA OF BOTH TUBES, BOTH OVARIES, AND THE CORPUS OF THE UTERUS\*

CAREY CULBERTSON, M.D., CHICAGO, ILL.

THIS patient, a colored woman, thirty-six years of age, came into the Cook County Hospital in January, 1933, complaining of sharp pain in the lower right quadrant of the abdomen present for six months. She had had backache and uterine bleeding for one month. She had had two miscarriages in 1915 and 1916. She claimed that she had been losing weight since August, 1932.

The abdomen presented a mass, hard and irregular, which rose four fingers above the symphysis but was not tender. I made a diagnosis of fibroid of the uterus. The cervix was normal for a multiparous cervix. The corpus was upright and corresponded to the mass in the abdomen. On the left side was a mass high up and somewhat fixed, thought most probably to be inflammatory. The blood showed 2,800,000 red cells and 12,000 white cells. She was in the hospital from January. On the ninth of February she was transfused and was operated upon the next day. At no time was there fever.

The specimen shown was a fibroid of the uterus. The mass on the left side was an ovary about 8 cm. in diameter which was moderately adherent to the pelvic wall, but the adhesions were not thin and stringy, but of bandlike type. The right ovary was also adherent on the right side to the pelvic wall. There was no great difficulty in enucleating the mass. I regarded it as a fibroid until I found the left ovary, which proved to be a soft mass which readily broke down in my fingers and proved to be a carcinoma. The enucleation of this ovary was carried out without any great difficulty. After the tumor was opened we discovered a carcinoma of the corpus, about 4 cm. in diameter. At the time of operation I could not make out the right ovary. Later on, when I examined the tumor, I found the right ovary closely adherent to the tube. The tubes looked like ordinary pus tubes. They contained purulent material but microscopic examination showed carcinoma of each tube and of each ovary, all of the same type—endometrial.

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## EMPIRICAL USE OF BLOOD INJECTIONS IN THE NEWBORN TO LESSEN BRAIN HEMORRHAGE†

WALTER LESTER CARR, M.D., NEW YORK, N. Y.

*(From the Clinic of the Woman's Hospital)*

IN PRESENTING a brief report of blood injections in babies at the Woman's Hospital, New York, I wish to call attention to the paper read before this Society on May 1, 1928, "Examination of the Blood in the Newborn With Reference to Treatment for Hemorrhage."<sup>1</sup>

\*Presented at a meeting of the Chicago Gynecological Society, April 21, 1933.

†Read by title at the Meeting of the American Pediatric Society, Rochester, Minnesota, May 26, 1932.

<sup>1</sup>Am. J. OBST. & GYN. 18: 203, 1929.

That study of 200 babies was undertaken to determine whether they presented pathologic conditions of the blood that might influence hemorrhage at the time of birth, especially in premature babies or in those born after long labors or injury due to pressure or manipulation. The reports made showed conclusively that blood conditions were normal as indicated by the average bleeding time, coagulation time and fragility. Despite these negative laboratory results it was decided to carry this study further and to use injections of blood or serum empirically in all babies born under conditions resulting from toxemia, long labors, forceps, or manipulation. These babies frequently show at birth, blueness, irregular respirations, twitching, spasticity, tense fontanel and other symptoms of disturbed circulation. After consideration we adopted a routine injection immediately after birth of 20 c.c. of mother's or father's blood or 20 c.c. or more of blood serum and in some cases, both. Where tissue conditions showed poor circulation or a failure to respond to the blood injections we used salt solution subcutaneously up to 50 c.c.

In presenting a follow-up of a few of these babies, we determined to wait long enough to allow for a substantial growth and physical and mental development. Thirty-six babies returned for observation at the end of one year. Of these 36 babies, born under difficult or abnormal conditions of labor, all were alive at the end of one year and 32 are recorded as normal in development, while 3 are noted as flabby, a factor not having anything to do with the blood injection but probably with the feeding; one baby with Erb's paralysis was doing well when last observed. As far as could be determined, all these babies appeared mentally normal for their age. The average time of the mother's labor was twenty-six hours three minutes, and the average age of the mothers was twenty-seven years eight months. They were grouped as para i, 26; ii, 6; iii, 2; iv, 2. The types of labor were as follows:

- |  |  |
|--|--|
| 3 Forceps to after-coming head.                    | 1 Uterine inertia, persistent occipitoposterior. Cervical dystocia. Maternal exhaustion. |
| 4 Breech.  | 1 Uterine inertia. Dry labor.  |
| 2 Pelvic deformity. Cesarean section.              | 1 Eclampsia.   |
| 1 Pelvic deformity.                                | 1 Weak pains. Bagging.   |
| 1 Contracted pelvis.                               | 4 Persistent occipitoposterior.  |
| 5 Toxemia (1 pair of twins).                       | 1 Persistent occipitoposterior. Uterine inertia. Fetal distress.                         |
| 1 Toxemia, persistent occipitoposterior.           | 1 Fetal distress. Maternal exhaustion. Cervical dystocia.                                |
| 1 Toxemia and pyelitis.                            | 1 Premature separation of placenta.  |
| 1 Toxemia, breech.                                 | 1 No advance. Rapid and irregular fetal heart.   |
| 1 Transverse arrest, persistent occipitoposterior. |  |
| 2 Prolonged labor.                                 |  |
| 1 Uterine inertia.                                 |  |
| 1 Uterine inertia. Prolonged labor.                |  |

The series may be summarized as follows:

4 Low forceps.	2 Cesarean section.
15 Medium forceps.	1 Breech and low forceps.
2 High forceps.	1 Version. Breech extraction.
4 Breech.	6 No intervention.

The babies in whom blood was injected show that this procedure is not injurious and may be used without injury to the structure of a newborn baby. Not only in cases of delay but also in babies with severe jaundice, as icterus neonatorum gravis, we believe injections of blood to be indicated. The clinical reports are to be extended by further records but at the present time it is fair to give the following.

#### CONCLUSIONS

1. The employment of blood and blood serum intramuscularly in babies born under difficult or abnormal conditions of labor is apparently beneficial. The rationale for its use must, of necessity, remain largely empirical.

2. The procedure is entirely safe.

3. The immediate effect of injection of blood is to stimulate respiration, lessen venous congestion, and to establish, by lessening the pressure in the veins, a better balance in systemic circulation.

112 EAST SEVENTY-FOURTH STREET

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## TUMOR OF THE PELVIS RESEMBLING EMBRYONAL CELL CARCINOMA OF THE OVARY\*

MARK T. GOLDSTINE, M.D., CHICAGO, ILL.

THE patient was a white, married woman, twenty-three years of age. There was nothing remarkable about her menstrual history. She had been married four years with no pregnancies. In the spring of 1932 she began having slight intestinal pains in the lower abdomen. In September she was operated upon for appendicitis and an innocent appendix removed. She did not do very well following this operation. She ran a little fever and the incision healed slowly. In October, one month after operation, the incision was reopened and the abdomen was explored. Some tissue was removed from the right side of the pelvis and sections made, which were diagnosed as embryonal cell carcinoma of the ovary. On December 15 examination disclosed marked rigidity of the lower abdomen. When the right leg was flexed on the thigh it was impossible to stretch it out on account of the severe pain. Rectal and vaginal examinations were impossible.

On December 20 we did a laparotomy and found normal pelvic organs, uterus, tubes, and ovaries. There was a soft mass about the size of a hen's egg on the posterior wall of the bladder. She had no bladder symptoms or blood in the urine. This mass infiltrated the right side of the pelvis. The abdomen was closed. Two weeks later she was allowed to sit up in bed. She had a massive gastric hemorrhage

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\*Presented at a meeting of the Chicago Gynecological Society, April 21, 1923.

which continued for three days and she passed away four days after the first hemorrhage. We explored the upper abdomen and found the gallbladder and liver apparently normal. There were no enlarged lymph nodes except the intestinal mass which we thought to be an enlarged pancreas. A postmortem was held.

The tumor filled the right side of the pelvis but did not invade the bladder mucosa. No invasion of bone could be demonstrated. It pressed the bladder slightly to the right. It did not invade the right tube, ovary, or broad ligament. The other tumor, 8 cm. in length, was located in the upper abdomen, slightly to the level of the umbilicus, at the level of the pancreas. The posterior wall of the stomach was definitely adherent to the mass. At the first examination it seemed to replace entirely the tail of the pancreas, but on removal it was found that the tail of the pancreas rode on top of the tumor. The interesting thing is its origin, secondary to that in the pelvis.

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## PARASITIC DERMOID OF THE OVARY WITH SPONTANEOUS AMPUTATION OF THE TUBE\*

BY DR. J. P. GREENHILL, CHICAGO

THIS specimen was removed from a woman, thirty-nine years of age, who came in complaining of attacks of rather severe cramps which she had had for eighteen years. She was a para vi and had two sets of twins. Her past history was entirely negative. The physical examination was negative except for the pelvis. The vagina, cervix, and uterus were normal. In the culdesac was a mass between 6 and 8 cm. in diameter which was tender and immovable. On the left side I could not feel the adnexa and those on the right side felt normal. The diagnosis made was ovarian cyst with pelvic peritonitis. At operation the following was revealed: The uterus was normal as were the right adnexa. On the left side no ovary was present although the broad ligament was perfectly smooth. The tube on this side was only 3 cm. long and had no fimbriated end, only a smooth, round tip. The mass in the culdesac was an adherent dermoid cyst approximately 8 cm. in diameter, on top of which was the distal two-thirds of the left fallopian tube with the fimbriated end present. The proximal end of the tube was smooth and closed. In other words, this was a case of a parasitic dermoid cyst, which had become adherent to the culdesac and had produced a spontaneous amputation of the associated tube in its transit. Microscopic sections of the removed fallopian tube showed an inflammatory reaction in its entire length including the fimbriated end. The ovary contained hair, a jaw bone and seven fully formed teeth.

Ogorek collected 73 cases of spontaneous amputation of the tube. Most of them were associated with either an ovarian tumor or an inflammatory condition. To produce an amputation of the tube there must be adhesions in addition to torsion.

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\*Presented at a meeting of the Chicago Gynecological Society, March 17, 1933.

# POSTNATAL INFECTION DUE TO SHORT-CHAIN HEMOLYTIC STREPTOCOCCI\*

BY DR. LESTER E. FRANKENTHAL, JR., CHICAGO

MRS. L. S., twenty-two years of age, para iii, at term, entered the Michael Reese Hospital Maternity Jan. 3, 1933, at 2:00 P.M. in active labor. She had been attending the Prenatal Clinic, her last visit being Dec. 19, 1932. Subjectively and objectively she had been normal on all visits. One vaginal examination was made upon admission and at 7:40 P.M. a 2915 gm. male was born spontaneously. There were no lacerations. The placenta was expressed intact at 7:46 P.M. Moderate postpartum hemorrhage was controlled with one ampule of obstetric pituitrin.

At 5 A.M., January 4 the patient had a chill lasting thirty minutes. At 12 noon her temperature was 102.6°, pulse 132, respirations 26. White blood count was 36,500 and urine negative. A blood culture at this time was positive for a short-chain hemolytic streptococcus. Complete physical examination was negative.

On January 6 her temperature rose to 104.8°, pulse 144, respirations 36. Red blood count was 4,130,000, hemoglobin 60 per cent, and white count 24,400 with 90 per cent polymorphonuclear leucocytes and 10 per cent lymphocytes. Sedimentation time was twenty minutes. At this time 250 c.c. of whole blood were given. Patient had two other transfusions of 250 and 500 c.c. respectively, on January 19 and February 26. A vaginal examination on January 20 revealed a "frozen" pelvis with masses on both sides of the uterus extending halfway up to the umbilicus. She ran a typical septic course but finally became afebrile.

She was discharged from the hospital on March 14, seventy-two days after admission, at which time the only finding of note was a slight thickening of the right adnexa.

The baby was breast fed the first day and was then put on artificial feedings. He ran a normal course for two weeks (Jan. 15, 1933), at which time a slight serous discharge was noted from the umbilicus. The following day he began to vomit, became listless, refused his feedings and his temperature rose to 102.4°. The following day he died. Postmortem revealed an acute omphalitis; infected thrombi of umbilical arteries and portal and splenic veins; generalized acute fibrino-purulent peritonitis; hyperplasia of the intestinal and mesenteric lymph nodes. Blood culture from the heart and culture from the peritoneum revealed a short-chain hemolytic streptococcus.

On Jan. 20, 1933, the fourteen-month-old son was admitted to the Pediatric Division complaining of cough, pain in the left chest, discharge from the left ear, and temperature, which had been present for three weeks, two days before the mother entered the hospital. Blood cultures taken the next day revealed a short-chain hemolytic streptococcus. The child ran a septic course requiring three blood transfusions, but was finally discharged from the hospital on March 7, 1933, well on the road to recovery.

## CONCLUSIONS

1. Very similar short-chain hemolytic streptococci isolated in each case.
2. The fourteen-month-old child was coughing two days before the mother entered the hospital.
3. Assuming that the infection originally passed through the placenta, how can we explain the long interval in the newborn before the symptoms developed?

\*Presented at a meeting of the Chicago Gynecological Society, March 17, 1933.

# Department of Maternal Welfare

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CONDUCTED BY FRED L. ADAIR, M.D., CHICAGO, ILL.

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## MATERNAL AND INFANT MORTALITY IN 13,356 DELIVERIES, FROM 1922 TO 1932 IN AN OUTDOOR SERVICE\*

HERVEY C. WILLIAMSON, M.D., NEW YORK, N. Y.

*(From the John E. Berwind Free Maternity Clinic)*

ON JANUARY 1, 1922, the Department of Obstetrics and Gynecology of Cornell University Medical College began the medical supervision of this Obstetrical Clinic. My report covers the ten-year period under this management ending Dec. 31, 1931. During the major portion of this period the Obstetrical Clinic was under the supervision of the late Dr. Harold C. Bailey, who published a report of the work in 1926. This communication includes the statistics reported on that date.

The medical organization of the clinic during this period consisted of a resident obstetrician and three internes, the work being supervised by the men associated with the Department of Obstetrics and Gynecology at Cornell University Medical College. During the school year senior students from the college were assigned to the clinic, for periods of two weeks, in groups of from four to six students. During the summer months students were accepted from other accredited medical colleges. All normal deliveries were attended by the students under the supervision of the house staff; all abnormal deliveries were attended by the resident obstetrician or other house officers under the supervision of a member of the attending staff. The vast majority of these patients were delivered in the home by senior medical students.

Prior to the opening of the new consolidated New York Hospital, Cornell University Medical College, the University had no obstetric service directly under its control. The obstetric service at Bellevue Hospital was under our supervision only six months of the year and was used for teaching purposes. Consequently abnormal and complicated cases were of necessity referred from the Berwind Clinic to various hospitals and there was often a prolonged delay due to the difficulty in getting the patient's consent to such transfer and the problem of transportation. When we were on the service at Bellevue Hospital many patients were transferred there but, as the distance was great, the more serious cases were sent to nearer institutions.

During this period there were 13,356 deliveries. In this series women of 48 different nationalities were confined and approximately one-third were colored. There were 13,152 living babies born, including 168 pairs of twins and 3 sets of triplets. There were 378 stillbirths and 180 neonatal deaths. The neonatal deaths were those occurring within the ten-day period of observation by the obstetric department.

The most important function of a maternity clinic is to prevent maternal deaths and to reduce to a minimum the number of stillbirths and neonatal deaths. In this series there was a total of 48 maternal deaths; only 14 died in the home, the remaining 34 dying after transfer to various hospitals. We have divided these deaths into three groups: (1) those due to medical complications, the pregnancy being incidental; (2) those actually occurring in the homes and (3) those deaths in the hospital after the patients were transferred. Some of the deaths in hospitals followed

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\*Read at a meeting of the New York Obstetrical Society. May 9, 1933.

delivery in the home, others occurred following delivery in hospitals. Practically all that were transferred had serious complications such as placenta previa, eclampsia, etc.

The gross uncorrected maternal mortality, on the basis of the total number of deliveries, is 3.6 per thousand; on the basis of per thousand live births, the rate is 3.7 per thousand. Harrar in 1918 reported a rate of 3.1 per thousand confinements in 69,081 outdoor deliveries at the New York Lying-In Hospital.

TABLE I. MORTALITY AFTER TRANSFER TO HOSPITALS

Eclampsia:	
Preeclampsia (Developed eclampsia at Hospital)	
Twins	
Six and one-half months pregnant	
Nineteen days postpartum. Autopsy: acute hemorrhagic nephritis	4
Cesarean section:	
Shock (3)	
General peritonitis (three weeks postpartum)	
Placenta previa, 6 months pregnant	5
Placenta previa (6). One listed under cesarean section	5
Puerperal infection:	
Delivered in home	
Streptococcus endocarditis, manual removal of placenta in hospital	
Delivered in home, infection antepartum	
Peritonitis, rupture ovarian cyst, 6 months pregnant	
Antepartum infection (gangrene of uterus)	5
Toxemia of pregnancy: acute hydramnios	1
Premature separation of placenta, ruptured uterus (?)	1
Incomplete rupture of uterus (version) delivered in home	1
Shock. Retained placenta. Delivered in home	1
Inversion of uterus. Delivered out of service	
Stopped at Clinic seeking hospital care	1
Transferred	
Total	24

If the ten deaths which were due to medical complications are subtracted, the rate is 2.8 per thousand deliveries and 2.9 per thousand live births. The maternal death rate in the United States Registration area for the year 1929 was 7 per thousand live births; our gross rate, therefore, is slightly more than one-half the rate for the country at large, while our corrected rate is slightly less than one-half the national rate. The maternal mortality for the city of New York, as given in the Federal Report, is 5.2 per thousand live births for the same year.

TABLE II

	STILLBIRTH	NEONATAL
Difficult labor		
Operative delivery	73	25
Spontaneous	28	12
Prematurity and injury	36	49
Congenital abnormality	43	42
Maceration	100	0
Placental abnormality	17	0
Cord anomaly	34	7
Pneumonia	0	12
Atelectasis	14	6
Miscellaneous	33	27
Total	378	180

There were ten deaths from medical complications, none of which was in any way due to the pregnant state, including meningitis and pneumonia, 1; cardiac disease, 2; pneumonia, antepartum, 3; pneumonia, postpartum, 1; trichiniasis (autopsy), 1; diabetes, 1; and diphtheria, 1.

The actual mortality in the homes was 14 deaths in all. Surgical shock from various causes was responsible for one-half (7) the deaths, puerperal infection (4) the second most frequent cause. There was one death each from scarlet fever, status lymphaticus, and embolus after a normal delivery. The deaths which occurred in hospitals were all of the most serious type of obstetric complications. These are shown

TABLE III

L.O.A.	7285	Face and brow	45
R.O.A.	3377	Transverse	38
R.O.P.	762	Precipitate	1131
L.O.P.	323	No record	108
Breech	461	Total	13,530

TABLE IV. ABNORMALITIES AND COMPLICATIONS IN 13,356 CASES, 1922-1932

	NO. OF CASES	TRANSFERRED TO HOSPITALS
Forceps	402	21
Version and breech extraction	128	6
Breech extraction	105	5
Cesarean section	29	29
Craniotomy	6	4
Inversion of uterus	1	1
Rupture of uterus	1	1
Prolapsed part	65	5
Placenta previa	37	28
Premature separation of placenta	25	17
Postpartum hemorrhage	43	17
Manual removal of placenta	32	13
Eclampsia	28	23
Toxemia of pregnancy	100	33
Sepsis	19	18
Sapremia	13	2
Parametritis	11	4
Mastitis	21	5
Thrombophlebitis	6	1
Infection (no record of type)	12	10
Third degree laceration	6	4
Acute hydramnios	8	2
Pyelitis	9	3
Cardiac disease	14	5
Tuberculosis	7	6
Pleurisy	1	1
Pneumonia	10	9
Pneumonia and meningitis	1	1
Pernicious anemia	3	2
Psychosis	4	3
Trichiniasis	1	1
Diabetes	1	1
Diphtheria	1	1
Mumps	1	
Myoma	1	1
Elephantiasis	1	1
Epilepsy	1	1
Pulmonary embolism	1	1
Influenza	3	1
Varicella (chickenpox)	1	1



in Table I. The last case on this list was not registered with us. This patient stopped at the clinic with the uterus completely inverted. It was replaced and packed. The patient was then sent to a hospital where she died.

Table II shows a résumé of the causes for stillbirths and neonatal deaths. The combined rate, calculated from the total number of deliveries, is 4.2 per cent.

Table III gives the presentations and positions in the delivery of 13,530 babies, there being 174 babies delivered as twins or triplets. The large number (1131) called "precipitate" represents cases where the baby was born before arrival of a representative from the clinic. Many multiparous patients of this class do not consider themselves in labor until the second stage pains begin and the baby is born often before the clinic is called by telephone.

The forceps deliveries numbered 381 in all. Forty-seven were classed as high forceps, 203 as midforceps and 131 as low forceps. There were 45 infant deaths, four of which were macerated. Three maternal deaths occurred in this group.

The number of patients delivered by internal podalic versions followed by breech extraction, breech extractions and spontaneous breech deliveries totaled 533 with 589 babies, the extra babies being twins or triplets. There was a gross fetal mortality of 12.7 per cent, but, if this is corrected by subtracting the macerated fetuses and monsters, the rate is 10 per cent. One maternal death followed a version.

In Table IV, the various complications are listed with the total number of each and the number which were transferred to hospitals. This presents the many complications which may be found in a large series such as this.

In recent years there has been a decline in the number of deliveries on outdoor services. This report suggests that there is still a real need in a community with so varied a population as New York City for an outdoor maternity clinic. Such a clinic has proved of inestimable value in the teaching of medical students.

I wish to thank my associates, Doctors McCandlish, Conkey, Snyder, Nathanson, Mackenzie and Glassman, of the attending staff, for their cooperation at the clinic. Some of these men served during this entire period and others part of the time.

I wish to thank Miss Margaret Fiske and Miss Gertrude Skelly for their work in compiling the statistics which made this report possible.

# Society Transactions

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## NEW YORK OBSTETRICAL SOCIETY

*MEETING OF MARCH 14, 1933*

The following case reports and papers were presented:

Two Cases of Calcification of the Uterus Associated with Missed or Incomplete Abortion. Dr. F. R. Smith. (See page 896.)

Absence of Urethra Due to Obstetric Trauma. Dr. F. C. Holden. (See page 899.)

The Treatment of Postpartum Retrodisplacement of the Uterus. Dr. W. M. Findley. (See page 874.)

Trauma and Compensation in Gynecology and Obstetrics. Dr. J. R. Miller. (See page 839.)

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*MEETING OF MAY 9, 1933*

The following papers were presented:

Spontaneous Rupture of Uterus after Myomectomy. Dr. R. A. Hurd. (See page 889.)

Maternal and Infant Mortality in 13,356 Deliveries. From 1922 to 1932 in an Outdoor Service. Dr. H. C. Williamson. (See page 911.)

Experimental Leucemia in Relation to Experimental Neoplasms. Dr. M. N. Richter.

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## OBSTETRICAL SOCIETY OF PHILADELPHIA

*JOINT MEETING AT PHILADELPHIA WITH THE OBSTETRICAL SOCIETIES OF NEW YORK AND BOSTON, APRIL 6, 1933.*

The following paper was presented:

Five Hundred Women with Serious Heart Diseases Followed Through Pregnancy and Delivery. Drs. F. B. Carr and B. E. Hamilton. (See page 824.)

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## CHICAGO GYNECOLOGICAL SOCIETY

*MEETING OF MARCH 17, 1933*

The following papers and case reports were presented:

Amniography with Skiodan Injections. Dr. F. L. Adair and Dr. M. E. Davis. (See page 881.)

A Clinical and Experimental Study of Endometriosis. Dr. E. Allen. (See page 803.)

Parasitic Dermoid of the Ovary with Spontaneous Amputation of the Tube. Dr. J. P. Greenhill. (See page 909.)

Postnatal Infection Due to Short-Chain Hemolytic Streptococci. Dr. Lester E. Frankenthal, Jr. (See page 910.)

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*MEETING OF APRIL 21, 1933*

The following papers and case reports were presented:

The Calcium Problem in Pregnancy. Dr. C. B. Reed. (See page 814.)

Carcinoma of Both Tubes, Both Ovaries and the Corpus of the Uterus. Dr. C. Culbertson. (See page 906.)

Tumor of the Pelvis Resembling Embryonal Cell Carcinoma of the Ovary. Dr. M. T. Goldstine. (See page 908.)

## Correspondence

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*To the Editor:* Your issue of April, 1933, p. 484, contains a very valuable article by Dr. N. P. Sears on the fascia surrounding the vagina. It confirms my contribution published in September, 1931, on "Recent Work on Ptoxis (Prolapse) of the Female Pelvic Viscera," which Dr. Sears has evidently not yet seen, for many of the points he has raised are fully discussed in it. What he calls the "main sheet of the visceral pelvic fascia" is apparently identical with what I had described as the meso-vesicomullerian suspensory tissue of the female pelvic organs. The two surfaces of this tissue very closely correspond to what he has called the lateral and medial leaves of the main sheet, and it shares the similarity of being described as continuous with the superior levator fascia.

My object in writing is not merely to support some of the views expressed by Dr. Sears but to draw attention to certain anatomic and surgical dissections in this publication which prove conclusively that what Dr. Sears describes as the prevaginal fascia and certain tissues which others describe as uterovesical ligaments, are artefacts and consist in reality of the deeper layers of the true anterior vaginal wall. Nevertheless, the success of the operation of anterior colporrhaphy for cystocele depends on the way these artefacts are dealt with and a definite proportion of persistence of symptoms after this operation are due to neglecting to take a sufficiently lateral grasp of these tissues when suturing the wound. To take such a lateral grasp, the surgeon requires that confidence which only correct anatomic knowledge of the tissues being dealt with can supply, and it is therefore important to recognize the exact anatomic significance of these artefacts.

The physics of the vagina can in some respects be compared to those of a fairly firm multilayered tea-cosy suspended transversely at two opposite points on its convex upper surface. The amount of force necessary to turn such a cosy inside out (cf. prolapse) diminishes in proportion to the laxity of its inner lining (cf. vaginal wall), and the smaller the circumference and the tougher the consistency of the inner lining of the cosy compared to those of the outer layers, the more difficult it would be to turn it inside out. The greater the amount of slack and loss of tone in the anterior vaginal wall, the more easily does cystocele develop. In the cure of cystocele it is all important to get rid of the slack by approximating to the middle line the whole thickness of the lateral portion of the anterior vaginal wall including that artefact portion called the prevaginal fascia, and the success of the operation depends, not on isolating and imbricating these artefacts, but on approximating to the middle line sufficiently lateral portions of the whole depth of the anterior vaginal wall, after excising the central redundant portion.

The second impression of the publication referred to was published in March, 1932, and was reviewed in the *Journal of the American Medical Association* in September, 1932.

I am, yours respectfully,

E. HESKETH ROBERTS, F.R.C.S.E.

19 QUEEN ANNE STREET, LONDON, W. 1.  
September 25, 1933.

# Department of Book Reviews

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CONDUCTED BY ROBERT T. FRANK

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## Reviews of New Books

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### LIGHT THERAPY

Dr. Krusen<sup>28</sup> reviews the history of the therapeutic uses of the various forms of *Light Therapy*. He goes thoroughly into the sources and the effect and action of the different types of light therapy. The technic and forms of administration of this physical agent are carefully considered. He cautions regarding the dangers and disadvantages and the harmful effects of unskilled administration of light therapy.

So far as gynecology is concerned he states that ultraviolet radiation can be regarded as having but a very limited field of usefulness: in obstetrics, that prenatal irradiation and irradiation of the nursing mother may have some value in preventing rickets in the child.

In his review of ultraviolet radiation of the different systems he calls attention to a few diseases in which it may be considered a valuable adjunct to other therapy. He considers that light therapy has been recommended in an absurdly large number of conditions and must still be regarded as in a chaotic state. Such a book will do much to clear up this condition of therapeutic uncertainty.

PHILIP F. WILLIAMS.

This manual on the use of *High Frequency Currents in Gynecology*<sup>29</sup> describes the indications, methods, and results of the use of high frequency currents. The value of medical and surgical diathermy is stressed in the various gynecological disorders where they are conventionally employed. Methods of application are discussed briefly and clearly. This volume should be useful and practical for those who may desire information on the subject of high frequency currents in gynecology.

WILLIAM HARRIS.

The technic of *Encephaloarteriography*, as described by Lohr and Jacobi,<sup>30</sup> has been used by them in over 250 cases without an accident. They review the unsatisfactory results of other methods and compare the findings obtained by

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<sup>28</sup>*Light Therapy*. By Frank Hammond Krusen, M.D., Director of the Department of Physical Medicine, Temple University School of Medicine, Philadelphia. Foreword by John A. Kolmer, M.D., Ph.D., Sc., LL.D., Professor of Medicine, Temple University School of Medicine. Pages 133 and 33 illustrations. Paul B. Hoeber Inc., New York, 1933.

<sup>29</sup>*Les Courants de Haute Fréquence en Gynécologie*. By A. Laquerrière and D. Léonard. Préface du Prof. D'Arsonval. Masson et Cie, 138 pp., Paris.

<sup>30</sup>*Archiv und Atlas der Normalen und Pathologischen Anatomie in Typischen Roentgenbildern. Die Kombinierte Enzephal-Arteriographie*. Von W. Lohr und W. Jacobi, Magdeburg. Fortschritte auf dem Gebiete der Röntgenstrahlen. Herausgeber: Prof. Dr. Grashey. Köln. Ergänzungsband 44. Seite 83: mit 75 Abbildungen. Georg Thieme, Leipzig, 1933.

them with the findings by ventriculography. Their conclusion is that for the neurologist, and the neuro-surgeon, more assistance in diagnosis and localization of disease and tumor of the brain will be obtained by their described technic than by any other method.

The subject matter is divided into ten chapters dealing with the history of arteriography in general, the contrast materials, technic, the normal arteriogram, its alterations, various diseases, diagnosis of brain tumor and miscellaneous topics.

The monograph, copiously illustrated by many splendidly executed arteriograms, will be of undoubted value to those whose work touches upon neurology.

PHILIP F. WILLIAMS.

## ENDOCRINOLOGY

Dr. Harvey Cushing's short monograph on the *Pituitary Body, Hypothalamus and Parasympathetic Nervous System*<sup>31</sup> deals with several obscure and interesting subjects which first appeared in the form of a number of important lectures delivered at the Royal College of Surgeons, England, Mount Sinai Hospital, New York, Yale University, Johns Hopkins Hospital Medical Society, and the University of Toronto.

The first lecture gives a most instructive summary of our present knowledge of pituitary function, the second is based upon experiments performed on the human during operation, following the introduction of pituitrin injected directly into the cerebral ventricles. The third describes the syndrome consequent to basophilic adenoma of the pituitary, which is so clear cut and decisive that it must convince the most sceptical of the actuality of the syndrome of basophilic adenoma. The final paper deals with the possibility of neurogenic oesophageal and duodenal ulcer pathogenesis.

These lectures make delightful reading and contain a vast amount of clinical information upon which far reaching biological and clinical discussions have been based. The monograph has been gotten up in an attractive and faultless fashion.

R. T. FRANK.

Aschheim, after a lapse of five years, brings out a second edition<sup>32</sup> of *Pregnancy Diagnosis by Means of the Urine*. He does not exaggerate when he says that his test has become uniformly accepted and used. The earliest positive reaction which he has obtained is three days after the expected onset of a period. In one instance the reaction was positive sixteen days after a single cohabitation. In two thousand cases clinically followed up, 1.1 per cent of mistakes occurred. Seven cases of hydatid mole were examined, in which it was found that the reaction persisted positive from seven to eleven days after the mole had been completely removed. In these cases, 1 c.c. of urine contained 100 M.U., using the mouse as a reaction animal. From study of the literature, he found that eight thousand cases showed at most 2 per cent of wrong diagnoses.

This monograph is extremely valuable and should certainly be read by any laboratory man who desires to perform the Aschheim-Zondek, or its modification, the Friedman test.

R. T. FRANK.

<sup>31</sup>*Papers Relating to the Pituitary Body, Hypothalamus and Parasympathetic Nervous System*. By Harvey Cushing. Charles C. Thomas, Springfield, Ill., 1932.

<sup>32</sup>*Die Schwangerschaftsdiagnose aus dem Harn*. Praktische und wissenschaftliche Ergebnisse. Von Dr. S. Aschheim. Zweite, gänzlich umgearbeitete Auflage. S. Karger, Berlin, 1933.

Laqueur, Wagner and van den Velden have published in monographic form a "Referat"<sup>33</sup> from the Berlin Medical Society of 1932, concerning the *Value of Ovarian Therapy*. The first question posed—is ovarian therapy useful and if so, in what diseases?—would have been extremely valuable to the profession if it could have been answered categorically. Unfortunately even these investigators and clinicians leave the general medical man in as much doubt as before reading the monograph.

Laqueur states that our knowledge of the amounts of hormone taken in, produced and stored, is practically nil. He believes that the corpus luteum contains a substance affecting the specific dynamic action with thyroxin-like pharmaceutical properties. He doubts whether any biological titration is possible when made on organ preparations. Hence he prefers purified hormones for therapeutic application in which the amount of active substance can be determined. He discusses the effects of female sex hormone in detail and in spite of its antimasculine action, believes that it acts synergistically with the male hormone.

Wagner, in outlining the indications for ovarian therapy, heads the list with insufficiency of ovarian function, that is especially amenorrheas. Among the other indications, he places conditions of such varied etiological origin as sterility, bleeding and climax. In a full course, up to 10,000 M.U. may have to be given, but if more than 600 M.U. are given per dose, he believes that too great an amount is rapidly excreted. The extreme optimism of this author may be judged by the fact that he obtains a favorable result in 50 per cent of all ovarian underfunctions, including secondary amenorrheas and oligomenorrheas. I might state in parenthesis that most oligomenorrheas are self-healing and therefore therapeutic results are misleading.

Van den Velden takes up the therapy from the point of view of the internist. He has obtained results in hypertension, quite contrary to my own experience, occasionally in obesity and particularly in the monarticular arthropies of the menopause.

This rather uncritical referat, although containing a large amount of the literature, claims for ovotherapy far more efficacy than the extremely careful, detailed and critical summary which recently appeared in the *Journal of the American Medical Association*, from the Council of Pharmacy, would lead us to expect.

R. T. FRANK.

The index accompanying the three volumes of *Endocrine Medicine*<sup>34</sup> by the late William Engelbach, has now appeared. It contains the bibliography, index of names and index of subjects. This small volume will facilitate finding a given subject in the preceding three volumes which, otherwise, are difficult to use as a book of reference.

R. T. FRANK.

### SEX PROBLEMS

The work of this important monograph<sup>35</sup> on *Spermicides* was performed in the laboratory of Professor Crew, Institute of Animal Genetics, under a grant of the National Committee on Maternal Health whose headquarters are in New York City. There is a foreword by Dr. Robert L. Dickinson.

<sup>33</sup>Bewertung der Ovarialtherapie. Von Prof. Dr. Ernst Laqueur, Prof. Dr. G. A. Wagner, und Prof. R. van den Velden. Georg Thieme, Leipzig, 1933.

<sup>34</sup>Endocrine Medicine. By William Engelbach, M.D. With a Foreword by Lewellys F. Barker. Volume IV. Bibliography, Index of Names, Index of Subjects. Charles C. Thomas, Springfield, Ill., 1932.

<sup>35</sup>The Chemistry and Physics of Contraceptives. By C. I. B. Voge. Foreword by R. L. Dickinson. Jonathan Cape, London, 1933.

The monograph represents three years of intensive laboratory investigation. The sperm of various species, including that of the human, was employed.

A brief but well written anatomy and physiology of both the male and the female genital tract is found in the introduction.

The effect of chemicals on sperms, including acids, alkalies, salts, alcohols, soaps, aromatics and alkaloids has been worked up in detail. Of all of the chemicals used, hexyl resorcinol seems of special interest, not only on account of its marked spermicidal effect, but because of its power to lower surface tension. Chinosol is a relatively poor spermicide.

A long chapter is devoted to the vehicles for spermicides. Next the innumerable proprietaries have been thoroughly studied.

The requirements essential for a good contraceptive are cheapness, smallness of bulk, non-staining qualities, lack of unpleasant odor, quick and sure action. According to the author, foam jellies are of greatest value in this regard.

Voge then takes up the practical considerations which must influence research and clinics in the further study of contraceptives. The properties of rubber are gone into, also the mechanical devices at present available. He enters into the preparation of condoms including tests of their strength and methods of packing, all of which should be of great importance to the manufacturers.

In conclusion he finds that foam jellies, if sufficient moisture is present, are the most reliable; next condoms; and finally occlusive pessaries if the rim is anointed with lactic acid jelly. There is no 100 per cent method. Investigators greatly need the aid of the medical profession to determine the clinical value if further progress is to be made.

This is a basic study, valuable alike to the manufacturer, the chemist, and the clinician.

R. T. FRANK.

The author of *The Sex Technique of Marriage*<sup>36</sup> has had a most unusual *curriculum vitae*, including thorough and fundamental studies in Scotland, Vienna, and Paris. Her experience during and after the World War took her into out-of-the-way places. Her laboratory researches are important.

Consequently it is not surprising that her book, designed for lay readers about to be or just married, is unusually informative, written on a high plane, and well worth recommending. An interesting foreword to the American edition which corresponds to the third English edition, has been supplied by Ira S. Wile.

Most of the serious difficulties in marriage arise from sexual maladjustment. This book deals with the science of mating particularly with the difficulties and anxieties incident to the early weeks of marriage. The text is unusually simple and well written. The tone throughout is beyond reproach. The subject matter, however, is at times even more detailed than appears necessary. This book should certainly prove of utmost value toward the end of an engagement and at the time of marriage but I hardly consider it the type of reading matter that young men and girls should peruse years before marriage is contemplated.

R. T. FRANK.

#### MISCELLANEOUS

*The Outline of Preventive Medicine*<sup>37</sup> prepared by the New York Academy of Medicine describes the relationship of prevention and precaution in medicine

<sup>36</sup>*The Sex Technique in Marriage*. By Isabel E. Hutton. Foreword by Ira S. Wile. Emerson Books, Inc., New York, 1932.

<sup>37</sup>*Outline of Preventive Medicine for Medical Practitioners and Students*. Prepared under the auspices of The Committee on Public Health Relations New York Academy of Medicine. Editorial Committee, Frederic E. Sondern, Chas. Gordon Heyd, E. H. L. Corwin. Second Edition pp. 441. Paul B. Hoeber, Inc., New York, 1932.

to the different specialities and to the general practice of medicine. The book is suitable, not only for physicians, but for reading by the intelligent laity. This second edition includes three new chapters and the revision of other sections gives additional material.

The chapter "Obstetrics" is written by Dr. B. P. Watson. He refers to the preventable nature of the majority of diseases and complications of pregnancy and labor first called to our attention by Ballantyne in 1901, and which has largely influenced the development, to its present degree, of prenatal care. In succeeding paragraphs attention is called to the prophylactic methods whereby some of the avoidable morbidities of obstetrics may be eliminated. In a broad view of obstetrics from a standpoint of preventive medicine Dr. Watson sums up in the statement that we must always have a long vision of the obstetric patient's future.

Preventive Gynecology is dealt with by Dr. R. L. Dickinson, whose pioneer work in this field makes him especially well fitted to discuss it. The life cycle of the woman and her activities are affected by preventive medicine. Faulty development, industry and the professions, methods of examination, genital and venereal diseases, faults of reproduction, malignancies of the pelvis, sterility, contraception and the marital relationship are most thoroughly discussed from the aspect of prevention through education and treatment.

There are many other chapters which have a relative connection with obstetrics and gynecology, such as urology, venereal diseases and pediatrics which may be read with profit if one wishes to have the broad concept of a woman's life as suggested by Dr. Watson.

PHILIP F. WILLIAMS.

*Urology in Women*<sup>38</sup> by Catherine Lewis is a short but valuable brochure dealing with the female urinary tract in those conditions in which the pathology and symptomatology for treatment differs in the two sexes. Venereal troubles are not included. It covers the urethra, bladder, ureters and kidneys.

On the whole, this small, compact monograph is excellent, simply written, and easy of reference. It is very well illustrated and I feel sure answers an important purpose for the general practitioner, and for the younger specialist. Even fairly rare conditions such as diverticula of the urethra containing stones, are described. I can hardly agree that urethrocele can be treated by electrotherapy. The treatment of carcinoma of the urethra, although a rare disease, could be more fully described, including ablation with the "radio knife" and radiotherapy.

R. T. FRANK.

Dr. Alice Ruhle Gerstel<sup>39</sup> discusses the present status of *Womanhood* from the Adlerian point of view. She analyzes the entire sex as one would analyze an individual from the standpoint of individual psychology, evaluating all of the human activities in turn, from a vantage point somewhere between the biological outlook on the one hand, and the social on the other. She stresses the effects of biological function and social adaptations upon each other, the rôle of the ever-present inferiority feeling, the interplay of social and egoistic tendencies, the personal protest.

<sup>38</sup>*Urology in Women. A Handbook of Urinary Diseases in the Female Sex.* By E. Catherine Lewis. William Wood and Co., Baltimore, 1933.

<sup>39</sup>*Das Frauenproblem der Gegenwart. Eine Psychologische Bilanz.* By Dr. Alice Ruhle-Gerstel. Verlag von S. Hirzel in Leipzig, 1932.



Those interested in Adlerian psychology will find this an entertaining and instructive experiment in the wider application of its methods to a group constituting half of the adult world. All of the human relationships are passed in review and subjected to the measuring rod of this method. Throughout the work there is an undercurrent of an assumption of a basic conflict between the sexes, the feminist protest of the inequality of men and women, and a plea for the awakening of class consciousness, possibly even in affiliation with political movements in the direction of more freedom.

The author's "Type of the Future" is a completely emancipated person with equal opportunities, equal potentialities, equal accomplishments, equal recognition, who can take the matter of sex "in her stride."

Freudian psychologists would undoubtedly read this book as if it were interlineated, and might thus find it extremely interesting. Of particular relevance to those working in the field of gynecology are the remarks regarding frigidity and the attitude of the male sex toward it. The author's opinion is thoroughly consistent with her approach, but does not, I think, correspond with our own experiences in either the prevalence of frigidity or the attitude of the male.

MAX D. MAYER.

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